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AMERICAN BLACKSMITH

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A New Prize Article Contest.

Readers of THE AMERICAN BLACKSMITH are invited to participate in a new prize article contest. For the best contributions upon wagon and carriage building topics, eleven prizes are offered, aggregating in value forty dollars. Any subject connected with the building or repairing of vehicles may be chosen to write upon, so that a wide range of topics is afforded. The articles will be judged by their practical value to readers, and the prizes so awarded. That one will be chosen as best which will be of the greatest benefit to the wagon man in his every-day work.

Ten prizes in all will be given; a first prize of twenty dollars, two second prizes of five dollars each, three serviceable leather blacksmith's aprons as third prizes, and lastly, four yearly subscriptions to THE AMERICAN BLACKSMITH. The conditions are very simple: First, the contest ends and all articles must be in our hands by December twelfth next. Second, all contestants must be regular subscribers to THE AMERICAN BLACKSMITH.

If you have had experience of any kind in carriage work, send in your article early. Never mind about the spelling—the editor will take care of that. Owing to the large number of prizes, your chances are good. Will you compete? Address your article—"Editor, AMERICAN BLACKSMITH, Drawer 974, Buffalo, N. Y."

Prosperous Signs for the Shipsmith.

There must surely be a great demand for competent shipsmiths all over the country. Every day we hear of new ports springing into prominence. In the north are our lake ports with their great internal shipping industries, and all along the Atlantic are dotted those thriving cities that derive their chief sustenance from the traffic of the sea. The South, too, is awaking to new life. Down in Texas, for example, is situated a town that has made tremendous progress of late years. Galveston, built on the shore of the Gulf of Mexico, now claims third place among the shipping points of the United States.

All this advancement means that ships are continually being built and repaired, and that a vast army of shipsmiths is required to keep up this mighty fleet.

We should like once more to ask any of our readers who are engaged in this branch of the craft to send us any interesting, useful bits of information or kinks that may have come to them in their daily work.

Contributors for the Coming Volume.

In this, the first number of a new volume, some announcement may be proper regarding the reading matter to appear in these columns during the coming twelve months. The names of those who will contribute articles, insure that the interests of readers in this particular, will be especially well cared for. They are among the brightest, foremost minds in their respective spheres, and it is to be doubted if the services of more up-to-date writers could possibly be secured. Whatever appears under their signatures can be implicitly relied upon by readers of THE AMERICAN BLACKSMITH.

Mr. M. C. Hillick will continue to conduct the department of wagon and carriage painting with the marked skill and felicity which has caused his efforts to be so highly appreciated in the past by AMERICAN BLACKSMITH readers. The articles on steel-working, by Mr. Joseph V. Woodworth, an authority on the subject, will be continued, and will be found interesting reading by all concerned with the heating, annealing, hardening and tempering of steel, of which topics it will fully treat. On machine and railroad blacksmithing, contributions may be expected from Mr. William B. Reed, whose excellent series of articles in the past make him well known to our readers. Solid. practical information, presented in bright, humorous style characterizes the writings of "Billy Buntz," from whom monthly articles will appear. His series, "The Progressive Smith as a Business Man," beginning in this number, will be good reading for all who run shops of their own. The department of horseshoeing will be especially valuable to practical farriers during the coming year, and many articles from writers standing high in the craft will appear. Two such authorities, known to our readers in the past, Mr. E. C. Perrin and Dr. E. Mayhew Michener, will be heard from at intervals.

Carriage and wagon builders will find much more interesting matter pertaining to their craft than in previous years. Special attention will be paid to this department. Readers should remember that they can aid greatly in making the paper more interesting by writing from their experience on any topic, and thus stimulating others to do the same. Attention is called to the prizes offered in another column, as rewards for contributions from readers.

Desiring to make this journal of maximum value to subscribers, the publishers request readers to ask for articles on any special topics of craft interest. In response to such demands, a series of articles on Mechanical Drawing for the blacksmith is now appearing, and

announcement is also here made of a series on the metallurgy of iron which will be given during the coming year, outlining the various processes of making iron and steel of different kinds, from pig iron to crucible steel.

Blacksmiths and Blacksmiths.

Shops differ. Between the ramshackle edifice, dark and dirty, and the bright, clean, scientific one, there are unnumbered stages of difference, until, taking the two extremes, it is hard to classify them as the same kind of establishment. Just as great, or even greater, is the gap between the two extremes of blacksmiths. On the one hand is the ungroomed, slouching individual who never reads—possibly cannot read—and can scarcely write his own name. On the other is the bright, intelligent man, neat and well-dressed, (for say what we will, personal appearance is a very fair index to a man's mental make-up) who reads all the current literature, and is able to talk intelligently upon any current topic.

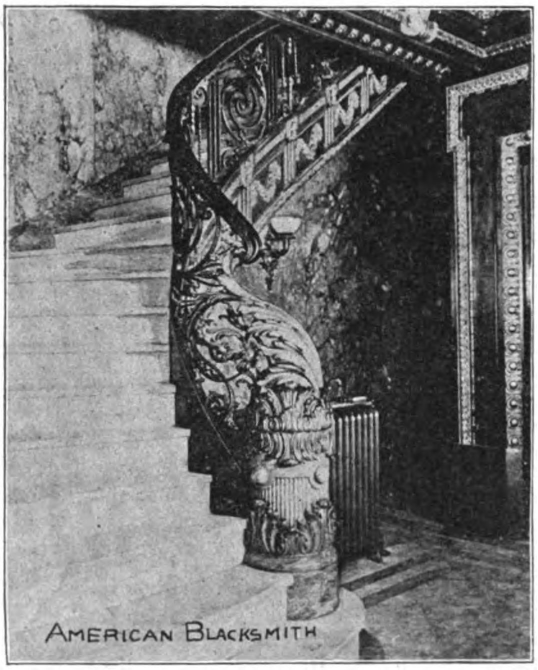
There is no reason why any man should not bring himself up to the latter standard. No craft in the world offers greater opportunity for quiet mental growth and thought. The man who makes and mends and plans, is, by the very nature of his work, bound to be intelligent. Why any intelligent man is satisfied to be anything but an honor to his calling is beyond comprehension, and the calling of the smith has always been especially honorable and worthy.

Regarding education—There never was a man yet who sincerely wanted it and could not get it. The present school system provides amply for the education of the younger generation, but even the man of advanced age may educate himself. We read every day of men of even forty-five, fifty and sixty years, patiently mastering the English language or setting out upon a course in one branch or another. It is not lack of opportunity, but lack of purpose that keeps people back.

Follow Directions.

Many are the failures men meet with in the daily craft routine. A smith tries a kink as recommended by another smith, and in spite of all that has been said of its excellence, he can derive no results from it. Just so, a repairman undertakes to varnish a job, and although his varnish has been advertised widely, and a brother smith has proved its value, he spoils the job simply by using it. Or a smith undertakes to use a compound that has been well spoken of on all sides, and to him it is useless.

Now, there is always something behind such failures as these. As a matter of fact, men read directions in a haphazard way, grasp the general notion and think they "know it all." They set to work on their own accord to do the job, and when it turns out a complete failure, these geniuses declare the recipe was no good (it is worth remarking that they always credit themselves with the good results.) In employing any method or using any compound, a smith should adhere rigidly to every detail of the directions given. It is this loose system of following directions that botches so many good pieces of work, and throws into disrepute so many good articles and recipes.



A BEAUTIFUL WROUGHT IRON BALUSTRADE.

Some Beautiful Work in Ornamental Iron.

A particularly rich effect is secured by the employment of foliage designs in wrought iron. Different adaptations of the large, graceful leaf of the Greek acanthus are exceptionally good in this metal. This also combines happily with conventionalized floral forms and geometrical figures. An example of this is seen in the beautiful specimen of art hammered iron work shown in the first engraving. The winding stairway of stone is most effectively guarded by a balustrade in wrought iron after this style. The final pillar and the curve of the rail are especially graceful and unique. This piece is to be found on the main stairway, Hanover Bank Building, New York City.

The other two engravings are from photographs, one of an iron grating guarding the vaults in this bank, and the other of an iron door in the same building.

All three are from the forge of Richey, Browne and Donald, Architectural Iron Workers, Long Island City, N. Y.

Talks to the Jobbing Shop Painter.—7.

M. C. HILLICK.

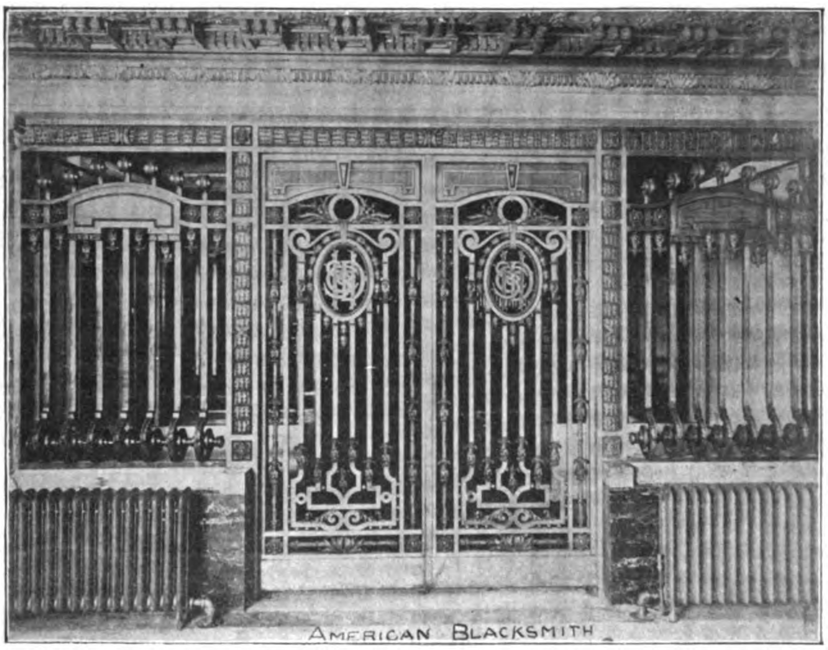
Ways of Creating Business During the Dull Months—How Some Painters Have Succeeded and May Succeed in Uniting Carriage Painting with Other Lines of Work.

The season's rush of carriage and wagon painting will have passed ere this is printed, and with the country painter, the next two or three months must be considered as a season for resting on the oars more or less. Naturally, if of an ambitious disposition—and ambition was never more needed in the paint shop than now—the painter casts about in search of something closely allied to carriage painting to assist him in tiding over the dull season. In the country and small towns, the painter cannot hope to rigidly adhere to carriage and wagon painting as a business the entire twelve months, as does his city brother. If located in the snow belt of country—and this has become an unreliable territory during recent years—he may count on a run of sleigh painting. This, of course, is of short duration, but it helps to fill in an "aching void" sometimes, and calls in some welcome money at a time when the "root of all evil," to quote an ancient book, passes as an exceedingly precious commodity. But if outside the snow line, when the bottom drops out of the carriage painting business, after the October Fairs have been called in, it is a matter for earnest calculation what particular line of work to take up in connection with one's regular business. To recite what others have done, under the personal observation of the writer, may help readers of THE AMERICAN BLACKSMITH in above noted emergencies.

A carriage painter in Central New York, during dull seasons, paints scenery for small opera houses and amusement resorts. He writes that he finds the work profitable, and it enables him to occupy his shop twelve months in the year. Another one makes a brand of

carriage rubber and leather dressing. He advertises this dressing in all the surrounding country papers, and deposits with leading country dealers in paint supplies a quantity of the dressing to sell upon commission. His trade has grown from year to year to such an extent, that the dull season of painting is altogether too brief to enable him to manufacture sufficient dressing to supply the trade.

Another makes striping pencils and sells them through correspondence to parties who find it inconvenient to manufacture their own pencils. It takes practice, of course, to become sufficiently skillful in the work to make a profit from this business. Some years ago through the writer's suggestion, a young carriage painter of Cortland, N. Y. was persuaded to take up the manufacture and sale of sword and dagger striping pencils. He advertised in the various carriage trade papers of the country, and presently found his services in great demand. Orders in plenty came to him from all parts of the country, and for several years he did a flourishing business; and it was only through neglect and inattention that his trade was finally permitted to languish. To-day, this field, outside of whatever trade the big brush-makers may command, remains unoccupied, and it is

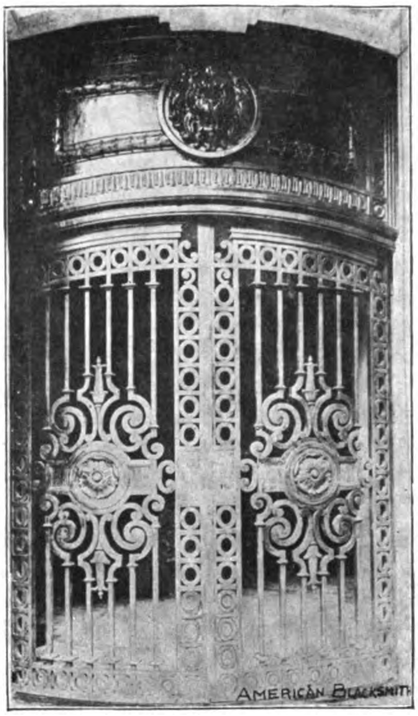


ANOTHER GOOD SPECIMEN OF IRON WORK—GRATINGS AND DOORS.

rich with opportunities for development.

Graining is a branch of work quite as well suited to the grasp of carriage painters. One of the ablest grainers it has been the writer's pleasure to know, was the late John Tied, of Ithaca, N. Y., who for a long term of years, was credited as being one of the best carriage body finishers in Central New York. As a carriage painter Mr. Tied began the study of different woods in their varied grain and color conformations; and from this study, given at leisure moments, he was led to attempt the imitation of woods with the result that he eventually became a past master in the art of graining. What this humble toiler in the carriage paint shop accomplished may be repeated by many a painter anxious to discover a line of work calculated to carry him over at least three dull months of the year. The popularity of grained surfaces that will pass under the title of works of art, is annually increasing, and while the autumn months are not the most favorable ones for securing work of this kind, there is, nevertheless, no small amount to be had for the asking by the competent grainer. Why not mix graining with carriage painting, and thereby increase the annual income?

Then there is the opportunity—the golden opportunity, perhaps—of buying carriages in the white, trimmed and ready to paint. This business is peculiarly adapted to the resources and circumstances of the country painter, and it offers him a way, like the voice crying in the wilderness, out of the dead level of nothing to do, to a legitimate enterprise invested with a fair measure of profit, if properly handled. The writer has had nine years' experience with a carriage painter, located in a small community, who, for a part of that time was engaged in buying vehicles in



A VERY EFFECTIVE DESIGN FOR WROUGHT IRON VAULT DOORS.

the white, and painting and selling them. Needless to add, there were no dull months with the painter alluded to, and the profits realized from this combination of business were entirely satisfactory. The blacksmith, the wood-worker, the trimmer, and even the country liveryman, has turned carriage dealer with varying success. Why should the carriage painter hold aloof from the experiment, when by natural right he is best equipped to take up this class of business and carry it to a successful issue? Selling vehicles in the white has grown into a flourishing business of large proportions, and it is a business which the carriage painter, seeking new and broader fields of activity, may incorporate with his regular line of work, and realize a fine profit upon a small financial investment.

(To be continued.)

A Wagon Kink.

D. M. LOVE.

I suppose all parts of the country are filled with a cheap grade of buggies which, after being used a year, will come loose at the corners, the side panels split and spring down below the bottom of the bed. Take a piece of two-inch band iron, from six to ten inches long, drill a hole for first bolt in loop, and insert between the bottom of the bed and the loop, so it will come all but flush with outside of

panel. Tighten up the bolt. This will draw the panel up to place and will always have something to hold it there. Put a screw in the back end of the iron to keep it straight.

Timely Talks on Carriage Repair Work.

A. J. YEAGER.

Welding Steel Axles.

I saw in the May number of THE AMERICAN BLACKSMITH, a method given

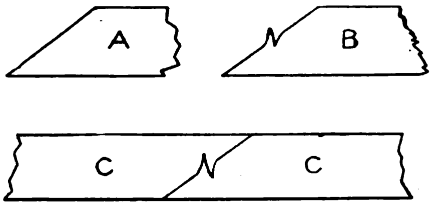


Fig 1. A.—READY FOR AN ORDINARY SCARF-WELD. B.—PIECE WITH NOTCH. C, C.—NOTCHED PIECES PLACED FOR WELDING.

for welding steel axles, and it seems to me that it is the old way of doing it, that is, getting a good heat, and striking right, and thus making a good weld. I give a simple sketch of the way I scarf the ends of axles. Shaping the axle as at A for the first performance, I then take a sharp chisel and cut across the scarf, when it appears as at B. I use Cherry Heat for a flux, and getting the desired heat, proceed to weld as shown at C. The hooks that are formed by the cuts of the chisel hold the ends together, and you cannot miss making a weld every time. This method applies to all kinds of steel welding. I should have saved myself a great many welds and heats had I known about this method twenty years ago.

Spring Welding—A Welding Compound.

JOHN CAMPBELL.

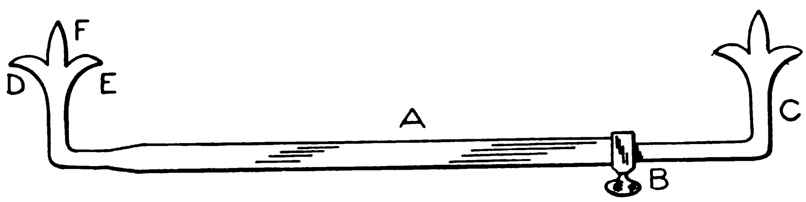
The accompanying illustration will show the method which I employ in welding spring leaves, and by means of which I always succeed in securing a compact weld. Cut as shown by the upper illustration, and then fork together, as the lower one indicates. I do not use any coal, but instead use good dry tan bark, breaking it up fine and placing it in the forge, which serves the same purpose. Take an even, steady heat; and when dressing, use lots of water on the hammer, and when cooled to a dark red, pour some common machine oil upon the weld and put the spring away to cool.

As a welding compound, use an ounce of carbonate of iron mixed with twelve ounces of finely powdered borax. I find this compound such an excellent one that you can burn an old rasp or file in your fire until it almost drops in two, put some of the compound on both pieces, take separate heats and it will weld as easily as a piece of common iron.

Calipers for Tire Setting.

C. C. HENDERSON.

In setting all kinds of tires, one often needs a pair of calipers to measure the tire in order to see when it is expanded sufficiently. Such a tool, as shown in the accompanying drawing, will be found useful in a great many places, and will repay making. A is a hollow pipe with a collar welded on at one end. The other end of the pipe forms the points D, E and F. B is a thumb screw in the collar, to hold the sliding end C. The points D are for the outside dividers, E for the inside, and F are trammel points.



ORIGINAL DEVICE FOR USE IN SETTING TIRES.

This tool is exceedingly simple, and I would not be without it in my work.

The Progressive Smith as a Business Man.—1.

BILLY BUNTZ.

The Treatment of Patrons.

Aside from having a clean shop and doing good work, the progressive smith is otherwise qualified to look out for his own best interests, the same as business men in other lines of trade.

Recognizing that out of the multitude of workers in the business world there are few who really meet success financially, the up-to-date smith knows that to depend simply upon the strength of his arm would be conducive to progression only to a certain degree; hence, he "works his head" by reading and studying everything pertaining to smithing, and adopts such new tools and employs such business tact as he sees have proven profitable to others in mounting the rungs to financial success.

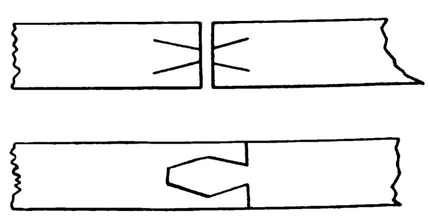
Under this plan he knows that whether one method or another of doing work will prove substantial depends largely upon the kind of material used and the way the job is handled—that he must vary his methods at times in order to follow a certain principle in doing jobs of all kinds.

Likewise, he learns that whether one maxim or another in business will prove profitable, depends much upon his own tact, shrewdness and judgment in following it. Consequently, when he hears some brother say that this, that or the other does not pay, he knows that that man is speaking more generally from his own individual standpoint, while other smiths may be making a grand success of the same thing by handling it differently. Quite a number of ways are there to "kill a cat," although some folk quite naturally think theirs the only one.

By wearing a "thinking cap" the progressive smith becomes proficient not only by adopting up-to-date methods of smithing, but expert in handling customers as well. He would rather see iron rust, than to allow his "upper story" to become "corroded." He knows that to please individuals, many of whom are of different mind, requires a fine perception of human nature. Thus, when a customer with a ridiculous hobby becomes "pig-headed," instead of showing disgust, he pats him on the back and proceeds to "change his mind" without hurting his feelings, by citing well-founded principles, and may say:

"Of course, I can put a felloe in as you wish, although I would dislike to have you become disappointed by the wood cracking, and that's what it is likely to do, as you will see by reading this catalogue of a manufacturer who has built thousands of wagons."

Of manufacturers' catalogues he has a regular library, which he studies as studiously as a child in school, gleaning from them practical ideas and talking points that he could obtain in no other



A GOOD WAY OF MAKING A WELD.

way. These he uses daily. In small matters, as where a customer insists that cast iron would answer where malleable iron or steel will be needed, he has only to give a chip of a casting a light

rap to illustrate that cast iron would not last a minute were something to strike it.

From a business point of view probably the worst feature with some smiths

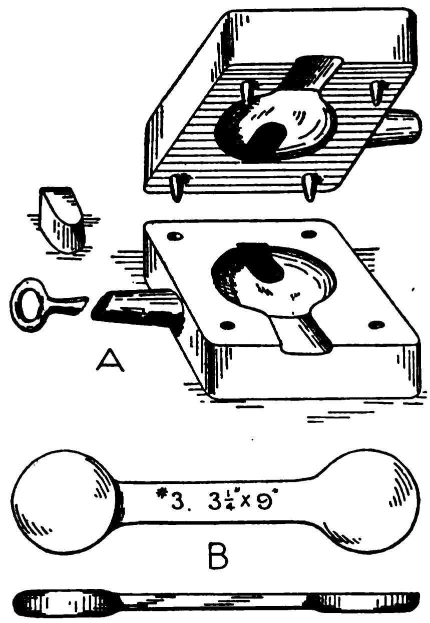


Fig. 47. FORMER AND BLANK FOR WRENCH FORGING.

is bad debts. All kinds of lien laws have been cited as a remedy, yet have helped little in bringing the cash. Consequently, some smiths endeavor to do business entirely on a cash basis, thereby losing worthy trade.

Bad debts oftentimes result from the smith being too easy with his customers, instead of impressing upon them that as the bill is small and the job really a cash one, it admits of little time being allowed. Where there is any doubt at all about the customer paying promptly, he should be "nailed to the debt" by applying business principles, rather than to allow him to depart, to pay when he gets ready—maybe not at all. While talking business to him the smith should employ language to "smooth down his feathers," rather than to "ruffle" them, something after this plan:

"I'll pay you next month," the customer may say, unconcernedly. He may mean this or he may not, and should be questioned.

"On the first?"

"About that time."

"That would be all right if I wasn't pinched for cash, having a good-sized bill to meet by the first."

"Don't believe I could pay that soon."

"While I don't mind giving credit—and everybody knows yours is as good as gold, yet just now it's a matter of cash with me, and I must have something to get money on. If you'll just sign this note I'll make the time two months."

If the customer has a friend with him he may be asked to sign, also, "as the bank likes to have two signatures on individual paper." Where a strong talk is made the customer cannot consistently refuse to sign, for to do so would show that he intended to be backward in paying, anyway. Notes endorsed are cashable at banks. They may be placed in hands of a collection agency and payment forced. It is best that they draw interest, even if the smith has to pay the interest himself.

An excellent plan in handling a poor-pay customer who asks credit, is to show him a drawer half filled with old bills, with the remark, "Would be glad to do it, but already have a drawer full of debts." Or he may barter his work for produce where the customer considers it an accommodation and is willing to make his prices lower than those of the store.

(To be continued.)

The Railroad Blacksmith Shop.—12.

W. B. REID.

Making Wrenches.

The method of making an ash pan shaker lever, shown in last article, can with advantage, be applied to a variety of standard forgings, such as brake hangers, spring hangers, brake cylinder arms, etc. For these, tools similar to those shown in Fig. 46, (see last article) with ball forgings of suitable proportions, would be required. Operations would be greatly simplified, however, by omitting the punching of the holes, which in forgings of this kind, are more properly machined.

The superiority of an article forged in this way is very evident. The compression of the iron successively in ball and forming dies solidifies the metal to a superior degree. Calculated of just sufficient stock, the ball adjusts itself accurately to shape of die without any preliminary cutting or trimming, (usual under other conditions) and leaves no superfluous stock to over-lap and destroy the edge of die under the impact of steam hammer.

The supply of wrenches for locomotive and general use, makes frequent demand upon the railroad blacksmith. With the proper tools and a little system, as outlined in the last article, we know of no method superior to the ball forging for making wrenches. The necessary outfit consists of a set of ball swages, and a set of forming and punching dies of suitable proportions. A, Fig. 47, shows the latter tool, easily and cheaply made of mild steel, the holes for punch, dowell pins and handles, being all the machine work necessary. The impression in tool is made under hammer by a correctly proportioned, smoothly finished pattern, see B, Fig. 47. The patterns for the different sizes of wrenches are preserved and used as those for other tools formerly described. Stamped upon the shank is the number of the ball swage required for the ends of wrench No. 3; also the stock required for entire wrench—¾ x 9 inches (round). This is for 1⅜ and 1¼-inch nuts. The ball is the same used for making the ash pan lever, shown in last article. The pattern for 2 and 1¾-inch nuts, reads (5) 4" x 10". For 1⅛ and 1-inch nuts, (4) 2¾" x 8"; for ⅞ and ¾-inch nuts, 2" x 8".

The method of making is very simple. A ball is formed on both ends of above stock, the stock left in centre being just sufficient to draw out shank to right length for each wrench respectively. With one heat the ball is forged, flattened and punched. The balls naturally flattening into discs with smooth, round edges, fit perfectly into the impression of punching tools. One blow of hammer, before inserting punch, checks down the neck of wrench in a smooth, perfect manner and clear of interference in drawing down centre, see A and B, Fig. 48.

To avoid a multiplicity of tools the same ball and punch are used for both ends of wrench; the adjustment of one end to the smaller nut being a very easy matter. These dies can also be

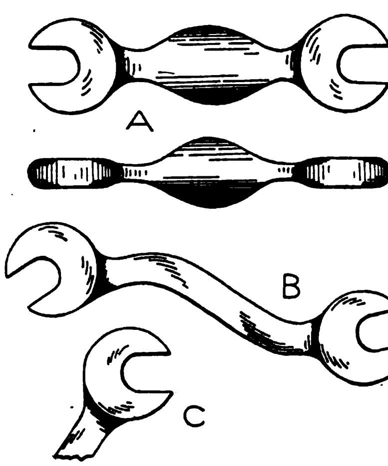


Fig. 48. METHOD OF MAKING WRENCHES FOR LOCOMOTIVE WORK.

adopted for side wrenches (C, Fig. 48) by having an additional impression of shank made in die at proper angle, the double impression in no way impairing efficiency of tool, except in dispensing with one of the dowell pins.

Given the material of right proportions, (hammered iron or mild steel) the largest of these double side wrenches can be made in one hour, producing a clean, uniform forging at a low cost.

The smaller wrenches for $\frac{1}{2}$ and $\frac{3}{4}$-inch nuts can be stamped more advantageously out of $\frac{3}{8}$ or $\frac{1}{2}$-inch boiler plate, in a tool similar to B, Fig. 49. The cutting surface of this tool is a cast steel plate riveted into the grooved iron block. An additional guide plate for top, with dowell pins, being required to guide punch A. A $\frac{7}{8}$-inch rod screwed into side of block serves as a handle. The ends of these small wrenches can be finished in one heat, in small tools similar to B, Fig. 47; but more conveniently adjusted in spring swage fashion.

Grouping the nuts with sizes marked upon a handle as shown at C, Fig. 49, is a neat and convenient arrangement, facilitating the work of finishing the wrenches.

(To be continued.)

A Welding Trick.

BY B. E. B.

I know that a great many smiths, and good ones too, look upon steel welding with something little short of fear. The way I go about it is first to be sure my fire is perfectly clean, and then to take my heats very carefully, getting as good and even heat as possible without overheating the steel. After proceeding in this way, and using borax only for a flux, if one does not succeed, let him try mixing some fine borings with the borax and covering the weld with this. I find that borax and fine steel borings from my drill are a splendid compound for steel welding.

The Elementary Principles of Mechanical Drawing.—5.

How to Make Working Drawings.

In making a mechanical drawing the one aim should be, not to makea fine, artistic sketch, but to make a drawing every line of which has meaning that will help to explain the object represented and enable the mechanic to construct it from the sketch. Of course every draughtsman will endeavor to turn out as neat and sightly work as possible, but this is only a secondary aim.

In entering upon a description of how to make mechanical drawings, we must remember that little more can be done than to outline the general way of going about it. The best thing for anyone desiring a knowledge of the principles of drawing is to start in and make mechanical drawings of different things, rough ones if need be. Choose the simplest objects first and proceed from them to drawing more complicated forms, taking care that every line and step is well understood. Readers of THE AMERICAN BLACKSMITH are invited to freely question the editor as to any difficulties or perplexities which may arise.

In the following paragraphs will be found a general outline of procedure, and to illustrate we will choose an anvil as our piece to be drawn.

One of the first things to consider in making a drawing, is what point of view will give the clearest and most complete idea of the whole object. Or, when it is too complicated to be represented in a single view, the first step is to fix upon what views will show the object completely with the fewest number of views. In the case of our anvil, one side view, one end view and a top

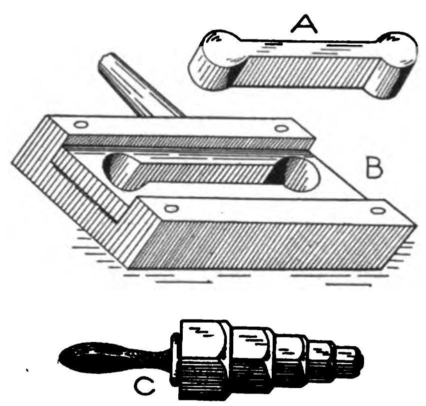


Fig. 49. A, B.—CONVENIENT FORM OF DIE AND PUNCH. C.—A NEAT ARRANGEMENT FOR GROUPING NUTS.

view or plan would probably be all that are necessary. Two end views are given here for greater simplicity. It is never well to complicate a view by trying to show too much in it. Having selected our views, the next step is to draw our center lines, the horizontal one AB and the vertical one CD, and upon these start to draw our principal view. As we assume our center lines to run through the center of the object, the top and bottom boundary lines are located by laying off to proper scale on DC on each side of the center O, half the height of the anvil, as OE and OF. A convenient scale should be chosen. Our scale will be one inch to the foot—that is, every foot of length or width of the anvil will be represented by an inch of length or width on the drawing. The scale should always be given on the drawing, so that the mechanic who has the article or pattern to make, can find the length of any line not dimensioned, by scaling it off, i. e., measuring its length on the drawing and multiplying by the scale. For instance, a half-inch line on our drawing represents a six-inch line on the anvil itself.

Using our T-square, we draw light horizontal lines through E and F, and then reducing our corresponding measurements on the anvil to scale, lay off with dots. the distances EG, EH, EJ, EK, OL, OM, FN and FR. Locate the points P, Q, S and U.

Now, having all ready, sketch in lightly in pencil, the outline of the whole anvil, making the various lines pass through the points scaled off. Use the curves (described in article No. 1 of this series) or the compass to sketch in the curved lines of the boundary, and with the T-square and triangles secure the straight lines. As our anvil sketch is in elevation, and the hardy hole does not extend to the side surface, this fact is indicated by outlining it in lines of long dots. Every line on the anvil, i. e., every sharp junction of surfaces must be represented in the sketch. When these are on the outside and visible to the eye, they are shown in plain lines, but when an inside line is to be indicated, a dotted line is employed to show this fact, as in the case of the hardy hole.

Having made a complete drawing of this view (side elevation) of our anvil, we proceed to represent the other necessary views of it. The top plan must be given, and, in our case we will also show two end elevations. In drawing the top plan, we show it as it appears by looking down on it from directly above. First an additional center line will be required, assumed as dividing the top surface of the anvil into two lengthwise portions of equal width. The position of the lines or points gg, nn, pp, qq, rr, h, j, and k are obtained by projecting the corresponding point G, N, P, Q, R, H, J and K up from the figure below. These projections are obtained by use of the T-square and triangles. Placing the square across the board and triangle in position (as described in a former article) find the points vertically above on the plan that are to correspond with the various points on the side elevation. The lengths of these lines, as gg, nn, etc., are taken from measurements of the anvil, reduced to scale, and laid off. The hardy and bolt header holes can be located on this top view and drawn in.

After placing vertical center lines for the two end views, proceed to find the corresponding points as before, placing

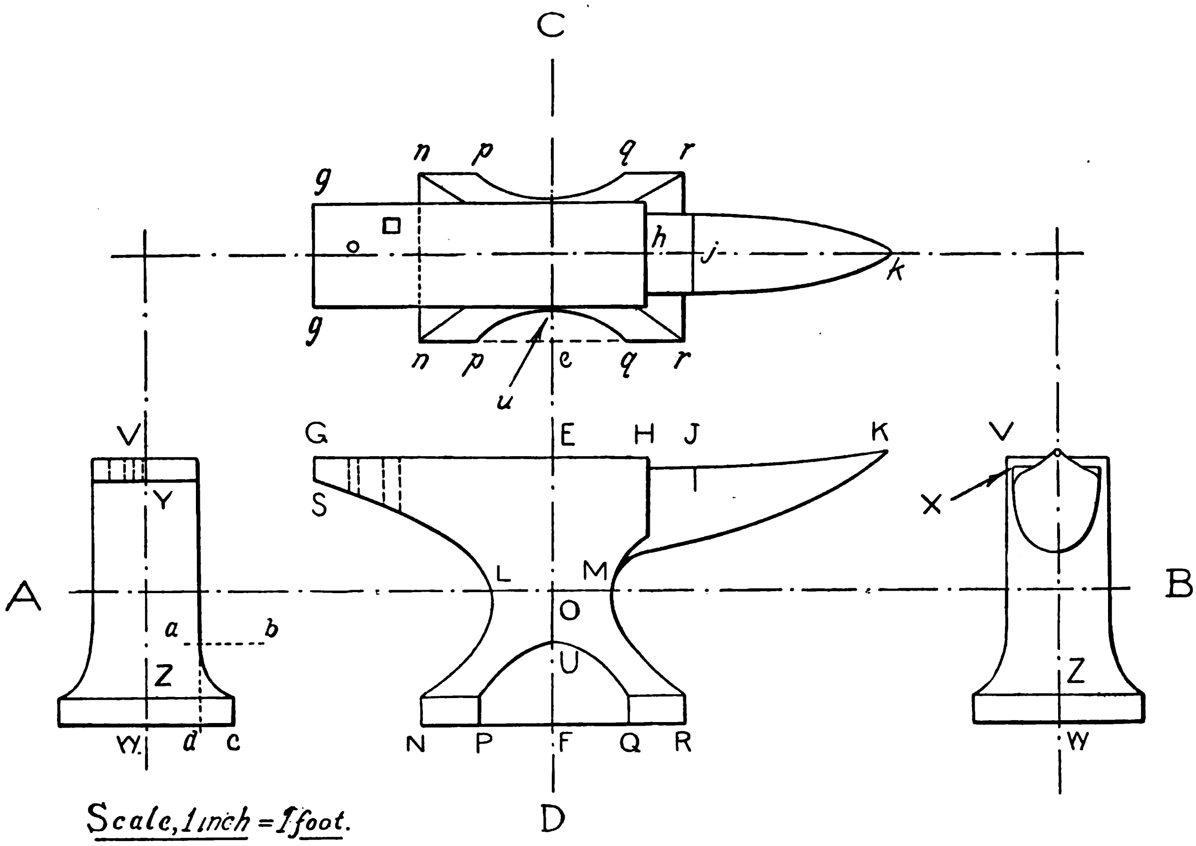
the right end elevation to the right and the left to the left, as shown. This position of all horizontal lines on these two figures can be obtained by projecting them from the side view first drawn. These horizontal projections will be done with the T-square. V is obtained by horizontally carrying over the point G. Y is obtained from the point S in the same manner, Z from T, W from N, X from J, and the height of the point of the horn in the right hand view from the point K. We have thus determined the horizontal heights of the various lines as points on the end views. As we have already laid off on our top plan view the lengths of these various lines, we can save time by taking our measurements direct from this top plan view. In other words, the length of the line V in either end view will be equal to gg of the top plan view, and similarly the length of the base line W in either end view will be equal to the distance nn. It will therefore simplify matters, instead of going through the process of taking measurements from the anvil and reducing them to scale, to take our dimensions from corresponding lines already drawn on the top plan view, as already explained.

Having determined the position and length of the various lines on the anvil, we are ready to draw them in lightly in pencil, in anticipation of inking them in finally if this is to be done. The various curves can be sketched in free hand first, and then put in more carefully by compasses, or by use of the irregular curves explained in former chapter of this series. In this way, the finished drawings of the anvil may be made. It will be understood that the letters on the drawings here given are only for our purposes of explanation, and would not appear on our finished drawing. It will be interesting in this connection to bring out the connection between the different views of the drawing by determining exactly one of the points of the curve on the side of the anvil in either of the end views. Referring to the side view, the point U of course lies in this face of the anvil, and in the top view the point u also is situated in this face. Project U to the left, drawing the line *ab*, lay off *cd* equal to *eu*. Project the point *d* up vertically and where it cuts the line *ab* will be located a point through which the curve of the side of the anvil must pass, as shown.

In the following chapter will be explained the use of the different kinds of lines, the principles of shading, dimensions, lettering and reading of drawings.

The succeeding chapters have already been outlined as to general treatment of the remaining topics.

(*To be continued.*)



COMPLETE PROCESS OF MAKING THE NECESSARY WORKING DRAWINGS OF AN ANVIL.

Practical Tire Welding Hints.

WILLIAM B.

In view of the long experience which I have had with tire work, both in factories and small shops, I feel that perhaps the following pointers may interest AMERICAN BLACKSMITH readers, though probably old to many.

There are a great many ways of welding tires, and not all are equally good. For instance some smiths will narrow down the width at the ends before welding it, or even cut off the edges after welding, so as to keep the tire from getting too wide. I do not believe in doing either of these things—the first increases the difficulty of making a weld, and the second is apt to produce weakness by sacrificing the amount of welded surface.

Then again there are different ways used for holding the ends together during welding, such as by splitting the tire, forking the ends together or even by riveting. I think the following method of welding is, however, greatly superior. After drawing the ends down to proper scarves, I spring the tire by pulling down on that end which is to be on top during welding, and in this

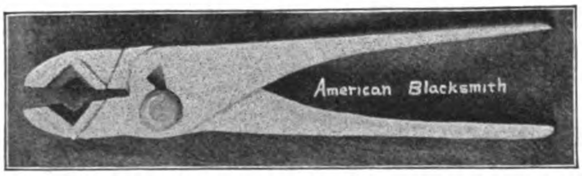
way get the two ends so they will remain pressed together firmly and steadily. Next I take a low heat and lap the swelled scarves on each side so that there can be no possibility of slipping out sideways. Also a few taps from the hammer over the body of the joint will serve to fix the end so there will be less tendency to pull out.

I then take my heat carefully. When bringing to the anvil to make the weld, the most important point to be remembered is that the point of the underneath scarf must be welded first. Strike right over this point just as soon as the tire is placed on the anvil, as otherwise the anvil will cool the thin lip immediately and make a perfect weld impossible. Next I weld the point of the upper scarf, and then complete the weld. While still with a welding heat, I turn the tire on edge and hammer it down well, until the tire is narrower in fact, at the weld than at other points. Then of course in the finishing processes it can be hammered to the proper width. By careful dressing the weld can be made to look like the tire at any other place.

In all welding work I take care that my fire is just right. Too old or too green a fire will not do, but make your fire up well beforehand; be sure you have it plenty deep enough with good clean, well coked coal. Regulate your blast so as to get an even hot fire. As to a flux, there are numbers of excellent compounds on the market, though many smiths can get the best of results from borax alone. I think the best way is to choose some good flux and stick to it.

A Novel Carriage Wrench.

We are indebted to Mr. A. L. Hamilton, of Kearney, Neb., for the photograph from which the accompanying engraving was made, showing a novel form of carriage wrench patented by him a few years ago. This wrench is intended for carriages, although it may be used for other purposes, such as for holding pipe, etc. It is adjustable in three different sizes and will take almost any size of nut.



A CARRIAGE WRENCH OF NEW DESIGN.

Steel and How to Treat It.—5.

JOSEPH V. WOODWORTH.

Annealing Processes.

The term annealing is used to designate a process through which tool steel and various other metals are required to pass, to allow of their being worked into shape and used for the different purposes required in the arts. The steel-worker must first learn that it means a great deal more than simply heating a piece of steel red hot and allowing it to cool; in order not to injure the steel during the process, he must have had experience in its use and have studied the characteristics of the particular brand of steel which he is to treat.

The annealing of steel is accomplished by heating it evenly to a high heat and then allowing it to cool slowly. This annealing increases the flexibility, softness and ductility of the metal; thus restoring to it the properties which have disappeared through excess of strain in rolling, drawing, twisting, hammering or forging, or other mechanical means; the same having caused the steel to become brittle. A fact that does not appear to be known by steel workers in general, is that the successful hardening and tempering of a tool depends greatly on the manner in which it was annealed previous to machining it. Thus it will be obvious that the correct annealing process must be understood in order for the succeeding process of hardening to give satisfaction.

First, always anneal any odd-shaped piece, or one with an irregular hole in it, after having roughed it down. The best way to anneal such pieces is to pack them in charcoal in an iron box, being sure to have as much charcoal at the sides of the box and the top as at the bottom, so as to prevent the heat from penetrating too quickly and unevenly. Keep the box at a red heat for an hour, and then leave it in the ashes to cool.

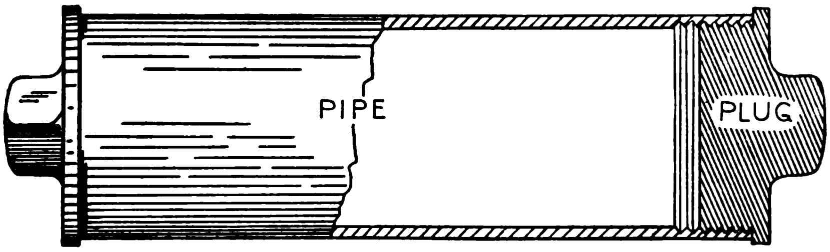
The proper heat for annealing the well-known brands of tool steel has been determined through experience to be almost a forging heat. By keeping the metal at a bright red heat for some time, all strains which may have a tendency to manifest themselves during the subsequent hardening process will be overcome. Never use cast-iron chips or turnings for pack when annealing, as they will decarbonize the steel to such an extent as to prevent successful hardening. Another thing that will decarbonize the steel is the packing of the parts too near the walls of the box. In fact the effect will be worse, as the decarbonization will occur unevenly, for the surfaces nearest the sides of the box will be affected the most, thus making any hardening that is possible unequal.

Of course there are a great many shops which have not the facilities to allow of using the above described methods. In such shops very satisfactory results may be obtained by heating the steel in a good charcoal fire to an even bright red heat. When the steel is at the proper heat, put a few inches of the fire ashes into the box and place on top of this a soft pine board, on which place the heated steel. As the wood will char and smoulder for some time, the steel will cool slowly, and the annealing will be thorough. Quite frequently a box of cold ashes or lime can be used to accomplish the same results, but to a lesser degree. However, the other method is by far the best, as the cold ashes, or lime, if used—both act the same—may chill the steel.

A sketch of a good annealing box for small parts is shown in the figure, half of which appears in elevation and half in cross sections, to show the manner of inserting the plug. To make it, take a piece of, say 3-inch iron pipe about ten inches long. Tap or thread both ends of the pipe and fit plugs to them; cast-iron ones will do. One of the ends may then be closed and the charcoal and parts to be annealed packed in, after which the other plug can be screwed in. With a box of this kind no sealing is necessary, as the plugs will prevent the entrance of air.

While most manufacturers of steel tools and parts have their steel annealed at the works where it is made, it will be found that the best results will be attained when the steel is annealed in the lengths which are to be used for the tools; as it will be found that most steel requires more care in annealing than the steel makers appear willing to give it. It is a well-known fact that more steel is spoiled through overannealing than in any other way. Steel heated too hot in annealing or kept at a high heat for too long a time, will shrink badly when being hardened; besides the life will be taken out of it. The steel should be heated to a cherry red; taking more time to heat it than would be taken were the same steel to be hardened. It should be heated slowly and given a uniform heat all over, through and through.

When only a small quantity of steel is to be annealed, heat it to a cherry red in a charcoal fire, and then pack it in sawdust in an iron box. Keep the steel in pack until cold. To anneal a large quantity of steel so that it will be very soft, pack it in granulated charcoal in an and then place in the furnace or oven, and heat to a cherry red. When the work has reached the required heat, stop the blast and allow the box to remain in the furnace and cool down with the fire. Do not remove the work from the boxes until all heat has disappeared;



A GOOD FORM OF ANNEALING BOX FOR SMALL PARTS.

iron box, as follows: Have at least ½ to ¾ inch of charcoal in the bottom of the box, and add a layer of granulated charcoal to fill in the spaces between the steel parts; also have ½ to ¾ inch at the sides of the box; then add more steel and finally 1 inch of charcoal, well packed at the top. Heat to a cherry red and hold there for about three hours; then allow the steel to remain in the box until cold. There are some kinds of steel which will not anneal satisfactorily, even when packed in powdered charcoal in air-tight boxes. When you strike steel of this sort, cover it over with fire clay and heat to a bright red heat, and allow to cool over night in the furnace or fire ashes.

A very satisfactory way to anneal bars of tool steel is to heat them in red hot lead—chemically pure lead, I mean—keeping the surface of the lead well covered with broken charcoal. By this method the heating can be accomplished uniformly, and one can see the color all the time. I have annealed a great deal of steel in this way, simply covering it with sawdust when the proper heat was reached, and allowing it to cool there. All steelmakers realize the injurious effects of overheating steel, and of over-annealing; and many advise, as I do, heating in hot lead as the only way to insure against uneven heating.

Very satisfactory results in annealing can be attained by using granulated raw bone, the treatment of the steel, of course, having to be in accordance with its grade and use to which it is to be put. A brand of raw bone for this purpose which I have used in the past with the best results, is "Hubbard's Granulated Raw." To anneal with raw bone, use bone that has been burned a number of times until it is almost pure white. Pack the work in an iron box with the bone well around it, the slower the cooling is effected the better the results will be.

Quite frequently a piece of tool steel is required for a repair job or for some other work that is in a hurry, and there is not sufficient time to allow of annealing it in the regular way. Then again a piece which has been hardened has to be annealed and machined in short order. When confronted with these conditions, the steel-worker can fall back on the more rapid methods of annealing, first and foremost among which stands the "water annealing" process. After he has tried this process a few times he will be delighted with the results.

In my next chapter I will fully describe the different methods of water annealing, as well as other quick and reliable methods of annealing tool steel and self-hardening steel without in the least affecting their hardening qualities.

(To be continued.)

A Steadying Device.

C. C. HENDERSON.

In our shop, we have a great many arch bars to shape and bend. These run from 3½ to 1⅝ by 4¾, thus making it very hard to weld without a steam hammer. For a long time I bent them over the anvil, but this was a little too difficult to do. I therefore took a block, for which purpose a swage block will answer nicely, and made four straps, 3 by 3¾ inch, cutting a slotted hole in one end and punching a round 1-inch hole in the other. I then made two keys for the same, and after bolting them on the block as shown in the figure, had a very handy arrangement. The iron is placed in between the straps and the keys are driven in, which will give a good tight grip and will hold anything. In our shop we make skid jaws or hooks, cleat hooks and anything which takes bending to do. For the purpose of cleat hooks, fashion a mandrel the same size as the cleat to fit between the straps, and then cut off the iron, heat, place it on the block, keep tight and shape with the fuller.

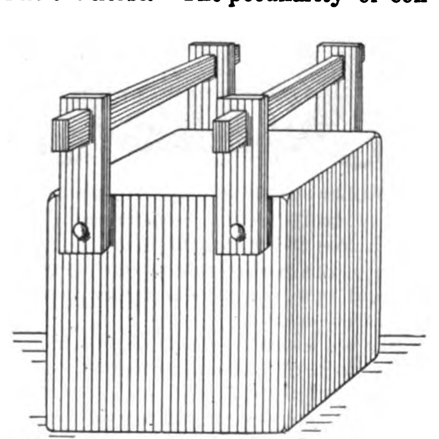
When a man has a troublesome line of work to do, the only way is to think out some device for doing away with the "troublesome" and leaving the "work" to be done handily and profitably. This device is as simple as it looks and costs little.

A Few Words on Shoeing Mules.

BY S. S. M.

The foot of the mule is round in front, but from the quarters back to the heels it is straight and perpendicular, having a form very like a contracted foot on a horse. The hoof should not be allowed to grow out too long. The heels should be pared down so that the frog is allowed to touch the ground. Sometimes the heels of mules grow together, causing lameness, by pressing against the navicular bone. Contraction and corns follow. Make a shoe the shape of the hoof and shoe just as a horse is shod. The shoes of a mule should be lighter and narrower than those of a horse. Five to six nail holes are generally sufficient for a mule's shoe. As the walls are very hard and tough use nails that are short but strong in the shank. Those with weak shanks are liable to bend in driving.

A little practice in shoeing the mule will enable a horseshoer to do the work as readily as shoeing an ordinary horse. There is one thing to be studied carefully, and that is the "mule nature"—which has become proverbial. Kindness and fearlessness combined are here the best devices, also. The mule is very like the horse. The peculiarity of construction of this animal's hoof should be carefully noted, but any smith attempting to shoe any animal whatever should strive to know something of its anatomy from a practical standpoint.


AN ORIGINAL AND USEFUL STEADYING DEVICE.

The Wish of the World.*

EDNA MANNERS.

An old cripple looked up with a glance
  shrewd and keen,
From selling shoe-strings for a penny a pair.
His clothes were in tatters and not over
  clean;
All unwashed was his face 'neath his long
  matted hair.
As he sat on the curb, there was woe in his
  eye,
For he counted his pennies, and, counting
  but ten,
He sighed as he thought of the beer they
  would buy
If they only were dollars—then counted
  again.

A lawyer looked up from his big office
  chair,
And a crease in his brow told of care on his
  mind—
"With an income of two thousand dollars
  a year
Can a clubman exist who for pleasure's
  inclined?"
As he fingered his bank-book and counted
  it o'er,
Every hundred he numbered, he wished it
  were ten—
"To be worried and scrimped is a horrible
  bore,"
So he conjured up visions and counted
  again.

A millionaire wearily lifted his head,
And a bundle of telegrams 'gan to explore.
Of the panic in Wall Street he hurriedly
  read,
And he murmured "By Heaven! I wish
  I had more."
For he planned a financial stroke, daring
  and bold,
To buy up the world and the whole race
  of men—
What a grand, mighty corner! He counted
  his gold,
And he cursed each poor million and
  wished it were ten.

* Written for the October AMERICAN BLACKSMITH.

HEATS SPARKS WELDS

October—May it bring fall prosperity.

Any fault-finding customers? With whom does the trouble lie?

Keep the credit good by paying as you go, and you will have a better heart to push collections.

Ere we know it, winter will be upon us again, with the same old round of work—old and yet new.

Before condemning a recipe be sure you have followed it exactly. Small deviations often lead to great failures.

Cents make dollars. A raise of a few cents on each horse shod will count up into a nice little sum at the end of the year.

Just what we need is the journal that tells in a clear, interesting way how to do the things that have bothered us.

Care of tools will save buying new ones. With proper usage a good tool should last until it is out of date, or even longer than that.

A curious smith shop has just come to our notice through a subscriber, in which the blacksmith works under an apple tree. We are trying to obtain further particulars.

Letters all answered? It is a business-like man every time who keeps his business correspondence right up to date, and people have naturally more respect for such a tradesman.

About side lines—the blacksmith of the near future may have among his repair jobs the mending of air ships. Blacksmithing will then be a rising craft without question. Times are looking up.

Look at our typical shops in the prize contest articles, and benefit by the other fellow's virtues or mistakes. Can you not bring your establishment up to the highest pitch of excellence? Why not?

Good humor counts. Of two equally skilled smiths, the cheerful one with a pleasant word is naturally preferred. A good laugh is the best medicine in the world—and the easiest to take.

Worrying and toiling over one's work does not get it done either more quickly or better. The man who takes things coolly and pleasantly has more head for planning and contriving than the fussy man. Keep the mental mercury down.

The man of pride—that is he who takes pride in his shop, his work and his reputation is sure to be an able craftsman. There is always something behind this kind of pride. It inspires confidence in patrons at the outset.

Advertise! First insertion draws attention. Second shows that you mean it. Third that you are still advancing, and after that, each advertisement tells the public that you are among the leading tradesmen of the day. Don't give up after one or two trials but keep right on.

A new machine for utilizing energy during the hot weather was devised recently. It is an arrangement on the back of a chair, which, when the lazy or tired person sits down and rocks, utilizes the energy expended, to fan the operator. What shall we have next?

The wagon repair man has his turn now. Have you read about our prize offer for the best article on wagon work? It's good, useful information that will count, not fancy wording or faultless spelling. We'll put your article in shape. Do not fail to try at once for one of the ten prizes. Contest closes December 12th.

Don't give up. If the trade is not paying, try every way to make it more profitable. Raise your prices, adopt up-to-date methods, advertise and draw custom, before you decide that you were not meant for a blacksmith. It is sometimes hard to tell just where the trouble lies.

Expert craftsmen are at a premium but there is also great demand for sober, reliable men of a lower degree of skill. The man who is always at his post and ready to do his best is often put over the heads of men of greater ability, who lack these sterling qualities of dependability.

The up-to-date horse has developed a "sweet tooth." One of the latest articles on his menu is molasses. The subject of the use of this very cheap material as horse food has been scientifically investigated by some prominent veterinarians with the result that it is highly recommended.

Too good to keep are many of the things some of our folk of the ingenious kind discover in their daily work, and yet they keep them all to themselves. A few minutes, pen, ink and paper and the idea may be the means of benefiting a thousand brother smiths. Send it in as it occurs to you and we will do the rest.

In choosing paint the carriage man should obtain that which is least injurious to the painter. Some kinds of green paint which contain arsenic are very poisonous. Others, being made from, say Prussian blue and Chrome yellow are quite harmless and equally good. This point is worth attention, especially when much of this color is to be used in the paint shop.

The ignorant man who wants to learn is to be respected. The hopeless case is the man who does not know and yet is too stubborn to admit that he is ignorant. Such a man will go on for years, following antiquated methods and declaring that they are good enough for him. He has used them twenty years and guesses he'll stick to them for twenty more.

One great advantage of the blacksmith's craft over many others is that it is not affected by the weather. The farmer is entirely dependent upon the elements. The carpenter, the bricklayer, the teamster, and hosts of other trades are seriously affected by the state of the weather. It's a good plan to keep in mind the bright points of one's calling rather than to dwell upon the dull. Try this plan.

Tom Tardy was smoking leisurely as we came up to his shop the other day. It was during the recent convention of Master Blacksmiths, and, after exchanging "Good-day," we asked him if he had been attending the convention. "When?" he asked. We told him it was going on at that very minute, and he only said, "Well now, funny I hain't heard." Then he added, "No, I hain't no time to spare for them new-fangled things. There's so much of this here play goin' on these days. A heap o' talk about nothin' an' a whole week gone, you may say. No, I won't go." Then he smoked away with an air of satisfaction, and we left him still thinking.

An enterprising smith had an elaborate sign painted, and when it was finished it was so beautiful that he hung it up in his shop. People from all the country round used to go to inspect this work of high art, and the smith won great celebrity. "Why do you not hang it out?" somebody asked. The smith looked wise. "For two reasons," said he, "first, there is every chance that somebody would 'hook' it. Secondly, people would think nothing of it if they could see it without the trouble of calling at the shop. It's a great ad. as it is, you see for yourself."

There was much shrewd wisdom in this smith's head, although upon first thought it would seem an odd idea to have a sign that was too expensive to hang out.

American Association of Blacksmiths and Horseshoers.

Every blacksmith, horseshoer and wheelwright cannot do too much thinking these days, upon the subject of craft organization. Some method is most plainly needed for doing away with the harmful results of craft jealousy and price cutting. Few classes of mechanics are more sadly lacking in unity, and no one but themselves, unless it be their families, suffer the ills due to it. We wish to strongly urge the advisability and more, the necessity, of individual craftsmen getting together and cultivating that spirit of unity and brotherhood which would, without question, result in better conditions all around. Mr. H. Stade, Flandreau, S. D., writes: "I am thankful to you for what has been accomplished. A friendly feeling is in existence among all of us in this town, which has never been before, and every night we are holding meetings and talking many things over for our improvement."

Get together with fellow craftsmen of town, township or county, form yourselves into a local, an association, an organization or not, as you will, but do not fail to meet together with your brother smiths, as men with men, at the earliest opportunity, to talk over your condition, the question of prices, the bad debt question, and methods for improving various existing evils. It is safe to say that such meeting of smiths in friendly spirit cannot but be to the advantage of all concerned.

The American Association most strongly advises for smiths in every section, the formation of associations, founded upon a brotherly spirit in the first place, as the greatest step in advance which they possibly could take. Plans for such associations will be cheerfully furnished to any by addressing Box 974, Buffalo; but by all means, take up the question of closer unity with your brother craftsmen.

You can aid in an endeavor to get a lien law in your state for the protection of blacksmiths and wheelwrights if you will. If you will drop a postal to the American Association, at the above address, you will be furnished full information.

Some Prices from Kansas.

KUETHER & DUKE.

Shoeing a span of horses	$3.00
Resetting a span	1.60
Setting buggy tires	2.00
Wagon tongues, put in	2.50
Buggy tongues, put in	2.00
Buggy shafts	3.00
Buggy shafts, single	$1.00
Cutting down wagon, bent rim	7.00
Cutting down wagons, sawed felloes	8.00
Spokes	.15
Felloes	.20
Half rims	.75
Buggy reaches	.75 to 1.25
Plow handle, put in	.50
Fork handle, put in	.25
Singletrees	.50
Doubletrees	.35, .50 and .75
Wagon reach	1.25
Neck yokes, buggy	1.00
Neck yokes, wagon	.75 to 1.25
Plow points	.65
Shovels	1.75
New lays plow lister	3.00
New shovels, set	2.50
Stubbing buggies, 1 inch	6.00
" " 1⅛ inches	7.00
" " 1¼ inches	8.00
Patent wheels, set	12.00
Sharpening well drill bits	.75 to 1.00

On the Method of Drying Timber.

The common idea that wood may be thoroughly dried by being placed for a certain length of time in a drying room, at a heat of from 50 degrees to 60 degrees C. or 120 degrees to 140 degrees F. is quite erroneous. Even the expert woodmaker may be mistaken in this respect, unless he knows exactly to what processes the wood has been subjected from the time it is cut until the time of its leaving the drying room.

It is not commonly known that wood which has been floated in rafts or otherwise gives more satisfaction than that which has been carried by rail or cart to the mill. While lying in the water the wood undergoes a beneficial process. Its sap and albuminous and salty substances are dissolved and come out at the pores, the water taking their place. At the ordinary temperature of river water, the process takes place slowly, but the time of immersion is usually sufficient to insure its completion. In some drying establishments, especially in Germany, this process is brought about artificially by special apparatus. The boards or planks are piled up in a long iron box with narrow spaces between; the lid is tightly screwed down so that neither water nor steam can escape and steam is turned into the box at a continuous pressure of 0.2 to 0.3 atmosphere, this being continued from sixty to seventy-two hours according to hardness and density of the wood. The steam opens up the pores and kills the protoplasm still living in the cells. Next, the timber is placed in a bath of water for about a fortnight.

The drying is conducted as follows: The boards are placed upon a cart with narrow spaces between, and the cart run into the first drying room, which is heated to from 50 degrees to 60 degrees C. or 122 degrees to 140 degrees F., by means of steam or hot water pipes, placed on one side and underneath the floor. One side is provided with ventilators to admit fresh air. The air, becoming heated and charged with moisture, is forced out at the other side of the room by numerous openings connected with the outer air.

After this process has been completed, the wood is sometimes taken directly to the workshop; but a more complete drying requires a second drying room. This room is heated by a stove extending its full breadth, supplied by fuel—usually coke—from the outside and kept at red-heat during the process. The pieces of wood are, each one, given a certain rectangular shape at the end, and then loaded upon a cart and placed in the room, which is then sealed up for fifty or sixty hours. The wood is then taken out and carefully examined. If the end has retained its rectangular shape, the piece is known to be thoroughly dry. If not, it is subjected to further drying.

Although many workmen are afraid of the trouble and expense connected with this drying process, the superiority of results in reality justifies all expense in this direction. Imperfectly dried timber is liable to warp, split or bend soon after being made up. Again, regarding wood that has been thoroughly "washed out," it is far less liable to be attacked by micro-organisms, since containing nothing but cellulose and liquose (upon neither of which bacteria thrive) it is not susceptible to attack by fungi. Moreover, the salts and other substances native to the wood have been removed, and these tend to absorb moisture, to the detriment of the article manufactured.

The N. R. M. B. A. Convention at Buffalo.

A short account of the Eleventh Annual Convention of Railroad Master Blacksmiths was given in the September AMERICAN BLACKSMITH. In this number are shown a few engravings taken from photographs of members, and extracts from the reports presented are also read.

Among the various manufacturers represented at the Convention were B. M. Jones and Company, Firth Sterling

Steel Company, The Crucible Steel Company of America, Ajax Manufacturing Company, the Cincinnati Railway Supply Company, Brown and Co. Inc., and the Ewald Iron Company. A very handsome souvenir was distributed by The Crucible Steel Co. The American Blacksmith Company presented to the members each morning, a complete printed report of the foregoing day's proceedings.

TWO BUFFALO MASTER BLACKSMITHS, RIGGS AND REILEY.

The Executive Committee for the ensuing year is as follows: T. J. Riggs, chairman; J. S. Sullivan; D B. Swinton; D. Fitzgerald, and J. Connors.

Mr. T. J. Riggs, Chairman of the Executive Committee, was born July 8th, 1855, in Warsaw Ontario. At the age of fourteen years he began his apprenticeship at the Great Western Railroad Shops, at Niagara Falls, Ont., and from this place was transferred to the Hamilton, Ont., shops, a year later. After serving four years there, he entered the service of the N. Y C. & H. R. R. at Suspension Bridge, N. Y., remaining two years in the capacity of foreman. With the hope of bettering his fortunes at the trade, he started for New Zealand, in the year 1876, but was obliged to return in the year 1881, on account of an impaired physical condition. After returning, he entered the service of the Erie R. R., at Buffalo, but left there three years later, to go with the W N. Y. & P. R. R. He remained in the employ of this Company four years, when he resigned to engage in the manufacture of switches and crossings until 1897, when he again entered the service of the W. N. Y. & P. R. R., now the P. R. R., as foreman of their Buffalo shops.

Mr. Harry Jeffery, one of the earliest members of the Association, went to work in 1848, at Newcastle-on-the-Tyne, serving seven years and working at one time in the shop of R. Stevenson, son of George Stevenson, of locomotive fame. Coming to America in 1857, he served for different companies since 1863, always as foreman. At the close of the war he was working for the Government at Chattanooga, Tenn., then going successively with the North Missouri R. R., the M. P. R. R., the Cincinnati Southern, and the Mobile & Ohio, leaving that position to go with the Pittsburg Locomotive Works. He has also been with the C. H. & D. R. R., and in charge of the Litchfield Car shops.

The following reports of committees at the Convention, will be of interest:

Repairs of Steel and Iron Frames; Best Method.

The repair of steel and iron frames is one of the subjects that should interest every master blacksmith, for there is no part about a locomotive that should receive more attention than the locomotive frame: it is the foundation; it belongs, first, to the forge and blacksmith, but of late years they come from the foundry, but for repairs they are obliged to go to the smith shop. The quality of the material used has a great deal to do with the success in repairs; first, the scrap should be selected with care, and none but good scrap bar iron used, and it should be double worked, care being taken not to overheat the slab. This done, you have iron good enough to put in any frame, steel or iron; if the slab is overheated, do not use it in repairs to your frame.

I believe a number of the fractures we find in the main bodies of our new frames are often caused by insufficient working of the material; it should be worked thoroughly to withstand the strain which a locomotive frame is subject to. We must bear in mind, a few short years ago the engines then in use were small compared with the engines of to-day. The steam pressure then was from 125 to 150 pounds, with 25 cars—which was a good load; the 225-pound pressure engines of to-day haul over the road from 50 to 60 cars, and the result is that we have more broken frames—they have increased the hauling capacity, and the question is, have they increased the frame proportionately?

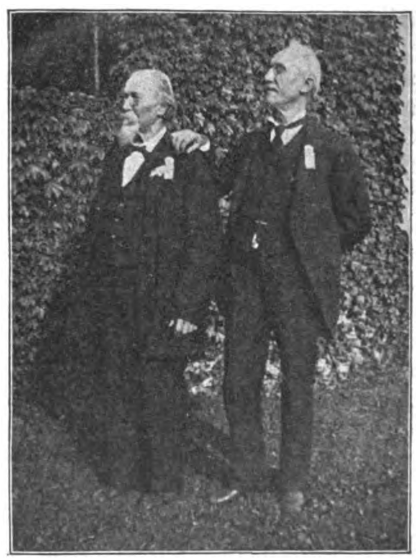
On the Pittsburgh Division of the Pennsylvania lines they have a number of steel frames in service, and in the last two years we have repaired a number of them, and have experienced no trouble in doing so.

They break in the main section, also in the front section; in the main section they break in the top and bottom members at the back hole; this necessitates putting on a half jaw by increasing the top and bottom member from 4½ inches to 8 inches, which is forged from select scrap, as stated elsewhere in this paper.

We also experienced the same trouble with the front section and we increased it from 4 inches to 6 inches, welding in iron in place of steel. I have a blue print showing the frame as it was received from the builders and one showing the frame after being repaired. We have repaired 190 of these frames, both iron, and steel. In repairing, I use the "V" weld with the fibers lengthwise of the iron; this style of weld, made with a good clean heat, I do not think can be excelled, but it should be remembered that any weld with dirty sulphurous fuel is a counterfeit, and cannot be guaranteed. In some of the frames I have handled for repairs, I frequently find blow holes or sand holes, and in the repairs to one particular frame, in cutting it, I found a cavity in it large enough to put a hen's egg in; I also found it very porous and spongy. In welding the steel frame I take a very high heat on them, using a good flux. In repairing our frame we make no difference between the two metals, paying as much for one as the other, as all our frames are repaired piece work. The question of repairing frames on the engine is one that should be given some consideration, as I am informed they make a practice of repairing all their frames in this way on some of our railroads, having a man whose duty it is to go from shop to shop to make repairs to frames. My experience is limited in that particular line; I have repaired them in the brace, where you can build a furnace around them, and I believe they were thoroughly welded, but I look at those particular engines every time I go through the Round House if they happen to be in.

I am informed we have master blacksmiths, members of this association, who have been repairing frames by this method for some time, and your committee would be pleased to hear from those gentlemen at this meeting.

We all know that the cost of removing, repairing and replacing the frame on the engine is considerable, and if this method of repairing frames is successful, we, as master blacksmiths, should give it a fair trial with the approval of the Master Mechanic. John S. Sullivan, Chairman



TWO VETERAN MASTER SMITHS, JAMES WALKER AND HARRY JEFFERY.

The Advantages of Machine Forging.

We are living in an age of quick production, and to meet the demands of the present, it would be impossible to do so by the old method of hand-work. All work on cars and locomotives has been increased in size, in some cases more than double what they were before the method of doing the work with tools was introduced.

Any new job that comes in the smith shop, of any quantity, the first thought is to get up a tool or former to make it under a hammer, bulldozer, forging machine or the machine most suitable to do the work.

We make all our passenger, postal and 70-foot car bolsters and transoms on a forging machine and bend them on a bulldozer. This work is done for less than one-third of the cost of hand-work, and made in less than one-third of the time it would take to do it by hand.

All work done by machine forging is more correct than hand forging, if the dies or formers are made correctly and kept in good condition. There can be thousands of pieces made and all will be alike, whereas very often in the case of hand-work they will vary some, especially when two, three or five smiths are put on one job.

For fast work and correct work I report favorably on machine forging and tools.

H. A. Folk.

Machine Forging. Its Advantages in Car and Locomotive Construction.

As a member of the committee on machine forging, its advantages in car and locomotive construction, I beg to report my experience in that line, as far as my experience goes. The progress in the last thirty years has been very great, when the greater part of the work, which is now done by machines, was done by hand, such as bolt headers, bulldozers, steam hammers and various other machines made to do certain classes of work for car and locomotive construction.

The bolt headers, bulldozers and forging machines are the greatest factors in producing forgings for cars, as one forging machine and a good man to run it can produce more forgings than ten fires can do in the same time; also it will of course, be more uniform.

You must get up the dies yourself to suit the forgings you wish to produce, as you know the machine is not of much use without them. It is the same way with a steam hammer. You can do almost anything under them if you have dies and formers to do the job. In a large shop it will take almost the entire time of a foreman in studying up dies and formers to do certain jobs that come to hand every day; not only that, but the tools for doing the work one year will be out of date the next, and as the time progresses, the engines built one year are not the same as they will be the next; and more so with the cars. They used to be 25,000 pounds capacity, now they are 100,000 pounds capacity. It is the same with engines. You take an engine built thirty years ago and put it beside one built today and see the difference; and so will all the workmanship vary on them, and the tools to produce these heavy forgings. If you have no up-to-date tools you cannot build cars or locomotives in a railroad shop and compete with the manufacturers. If the materials you make in your shop will cost any more than your competitors can buy them for, they will buy them, and the only way then for you to do is to get up tools so that you can make them cheaper than the manufacturers. For instance, when all cars had to have Janney couplers on a certain date and your company had a great many cars to equip, the same as ours, and were needing about two thousand draw bar stems per month, and you had no bolt header large enough to make them, like the case was here at that time. To weld a collar on them by hand was out of the question, as with one fire the best they could do was thirty-five or forty per day. I thought of making them under the steam hammer. To handle the bottom heading tool I put up a post by the hammer; the top header, forming the head, was a piece of round machine steel about four and one-half inches in diameter and five inches long, with the shape of the head carved in the center of it. After you drop your stem, with welding heat, in the bottom tool, you put the top header on the iron (your bottom header will keep the top in center of stem), you hit it two blows with the steam hammer, then turn it over and drive it out the same way, making a perfect head in center of stem. By putting four or five apprentice boys heating them in hollow fires, I headed up seven hundred stems per day and punched them in the same manner.

I inserted the punch in the top die, and the motion being so quick you can punch four or five thousand stems before you need to dress your punch. (I will send a blue

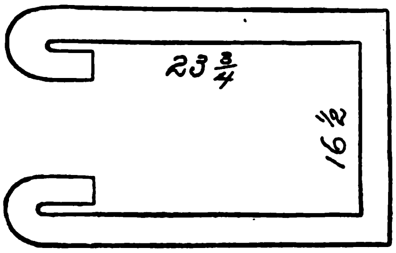
SOME MEMBERS OF THE N. R. M. B. A. IN ATTENDANCE AT THE BUFFALO CONVENTION.

print of these tools to anyone who wishes it, upon application.)

After getting all these tools up a change was made in car building, to use nothing but yokes. I then had to study again the same as before.

The yokes we make here are made out of 7/8 x 4" or 1 x 4" with lips doubled over the end, for a shoulder, as per sketch.

You simply take a round coupling link, weld a handle on one end, put a sharp fuller in the place where you want to make



MACHINE FORGING.

the bend for the hook, and press down with the top die, which will bend it over half way, then take your link away and hit one blow which will complete the hook.

To bend it on the other end, cast a pocket on your top die, on the front of it. make the bottom out of wrought iron as wide as you want the yoke and as high, and drill a hole in your bottom die and bolt it on to it, so as to meet the pocket in top die and lay the yoke. When straight across the bottom former, let the top die come down, which will bend your yoke the required shape. In this manner you can make about three hundred yokes per day. Will send sketch of this tool to any of the members, upon application, who wish to have them. I think this is a good tool, if you have no bulldozer.

I think it pays a railroad company to have up-to-date tools in the large shops, where you have use for them every day for car and locomotive work, as you can turn out about ten times the amount of work that you can by hand.

I simply illustrate these two items to show what good tools will do in turning out the work.

This is about all I can say at this time, as my time is very limited. J. Geo. Jordan.

Repairs of Iron and Steel Frames.

I have a few remarks to make upon the welding of steel frames, having repaired and made alterations in upwards of 160, irrespective of iron frames, during the last 18 months. The alteration consisted in welding a lower limb to the front of the frame, on account of change in front section. See Figs. 1 and 2. A fork weld was made here, and I have to say that there have not been any breakages where this weld was made. On the other hand, many of the said frames were repaired in other places where defective, such as top and bottom or rail, legs, etc., and in the majority of instances repaired by that ever ready makeshift called the "V" weld. Several of these were broken after leaving the shop, and I noticed that all were broken in the same manner right across the center of the "V" weld, the iron showing a coarse, fibrous section, fine grained on the outside, but coarser as it neared the center where the fibre was lost and the iron resembled a piece of hard coke.

Some of my hearers will say, why did you not change the grain? This was done as much as possible, and I will make the remark here that it makes little difference how you cut or draw the V-piece. The result under certain conditions will be the same and is brought about by the heat and consequent hammering in the act of welding, inasmuch as the V-piece obeys the law that causes a fluid to seek the point of least resistance when under pressure. This places the fibre of the iron at right angles to the back of frame and the reverse to where it is wanted.

I will also add that but for the lamination caused by hammering, which reaches about ¾ inch, the weld would not be much stronger than cast iron. Let it be understood that this applies to the welding by sledges, not the steam hammer, on this class of work.

The weak point is as follows: The "V" is made too acute. It has also been heated up to the point of disintegration. The little work expended upon it is upon one side alone. I will digress a little and ask the question: Would you place a forging made in this manner with so little work expended upon it on any part of the engine? I believe not. And as regards the fibre I have this to say, it has nothing to do with the breakage. A piece of coarse, fibrous iron does not always indicate strength unless it has been well worked, and the heat given generally on this class of weld reduces the iron to about the same condition as it left the puddler.

Various plans have been formulated to get the grain the right way, as if this was all that was required; but so far as my experience goes the "V" should be much more than 90 deg. for a steel frame, from the fact that the iron "V" being of higher temperature will slip, owing to the iron pushing the steel after the steel reaches its welding point, and it will not weld until this is reached.

To neutralize this it is necessary to place or insert iron wedges on the angle of the scarf. See Fig. 3. This is to give stock and to facilitate the process of welding between the iron and steel surface. This is improved by welding the wedges in place by light beats before the main weld is made. In regard to the "V" piece, it should be made from strong, close-grained iron, and should be heated sufficiently, but not high enough to burn the life and strength out of it. The least you depend upon the "V" heating the piece the better. Men in heating this class of weld aim to get it up to the point of disintegration, so that it will answer as a piece of putty or clay, so that there will not be much trouble to hammer it down on the outside, which will no doubt look well, but the material, when treated as above set forth, you will agree with me, is not first-class. T. C. Lace.

Case Hardening.*

At our last meeting there were misleading statements made as to the effect case-hardening had on the tensile strength of iron, some claiming it lost 10 per cent., others said 33⅓ per cent., but the facts in the case prove quite a good percentage in tensile strength favorable to case-hardened iron.

*Continued from September number.

I have brought several test pieces of case-hardened iron with me, which can be found on the Secretary's table. Test No. 1 and piece No. 1, with a one-half square inch area, was subjected to red heat for five hours and shows a carbon penetration of 1/32 of an inch, leaving 82 per cent of area not hardened and 18 per cent hardened. The tensile strength of this piece was 55,330 pounds per square inch. The tensile strength of No. 2 of same iron and dimensions, not hardened, was 54,420 pounds per square inch, which gives a percentage of 1⅛ in favor of the hardened iron.

Test No. 2 consists of the pieces with one square inch area. Nos. 1 and 9 were subjected to red heat for ten hours and show a carbon penetration of 1/16 of an inch leaving 76.5 per cent not hardened and 23.5 per cent hardened. The average tensile strength of these two pieces was 46,335 pounds. No. 4 same iron and dimensions, not hardened, had a tensile strength of 44,000 pounds, leaving 5 per cent in favor of the hardened iron. These pieces, Nos. 1 and 9, were allowed to cool gradually in the atmosphere and when cold were heated to a low red and quenched in cold water. Note how fine the hardened part appears.

Test No. 3, of pieces numbered 7 and 8 was identical with test No. 3 as far as time subjected to red heat, penetration, area of hardened and unhardened parts are concerned, but was quenched immediately in cold water. The average tensile strength of these two pieces was 54,185 pounds. Pieces numbered 5 and 6, not hardened, had a tensile strenth of 46,900, leaving 9 and 83-100 per cent in tensile strength in favor of the hardened iron. This also shows about 4¾ per cent in favor of quenching at the first heat, notwith-

Fig. 1.

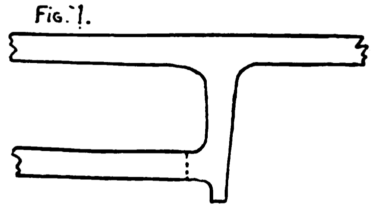
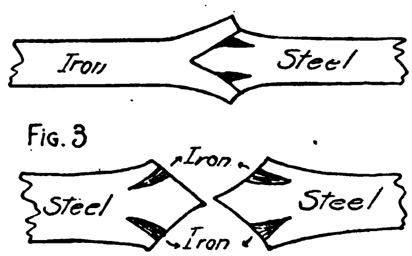


Fig. 2

Fig. 3



WELDING STEEL FRAMES.

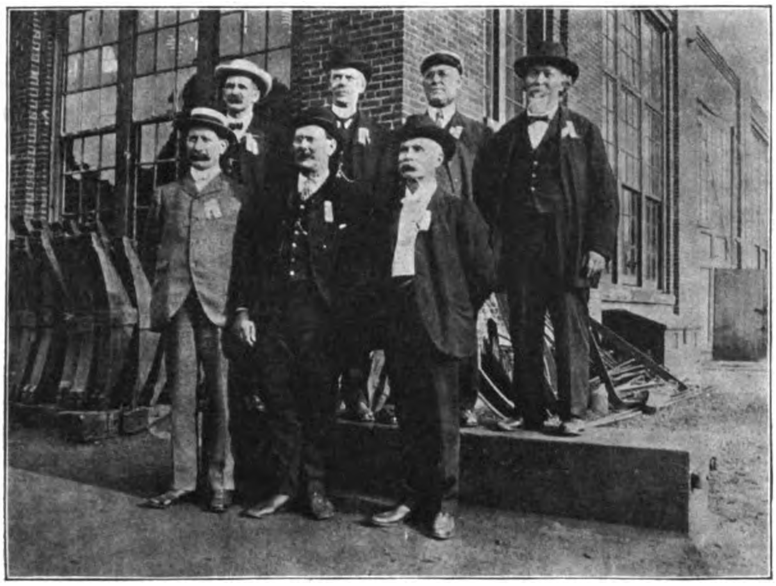
standing the refined appearance of hardened part of test pieces Nos. 1 and 9 in test No. 2.

Test No. 4 pieces numbered 2 and 3, were subjected to red heat for 15 hours, and have a carbon penetration of 3/32 of an inch, leaving 66 per cent of area not hardened, and 34 per cent hardened, average tensile strength 53,405 pounds. Average tensile strength of Nos. 5 and 6, not

hardened was 48,900 pounds, which leaves 8½ per cent. in favor of hardened iron.

One would think the above four tests conclusive that case-hardened iron will show a greater tensile strength than will the raw iron.

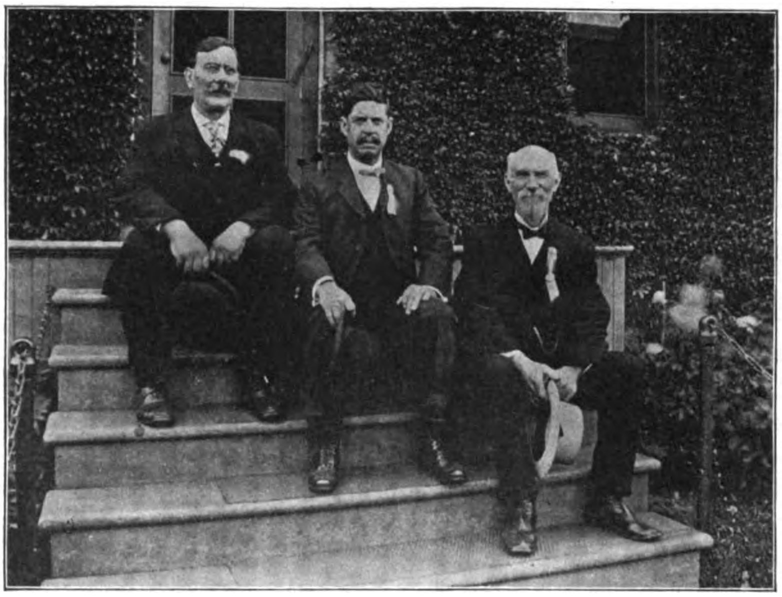
Case-hardening iron stiffens it, and will add to its tortional, shearing and bending strength equally as much as to its tensile strength; of course, when case-hardened iron reaches its limit of strength, it will check or crack, and sometimes break, but the same strain would disqualify raw iron in the beginning.



A GROUP OF MASTER SMITHS.
MESSRS. RIGGS, FENWICK, BUCKLEY, WALKER, KEANE, LINDSAY AND LACE.

When we note that five hours at a good red heat will harden iron of a small sectional area 1/32 of an inch deep, ten hours 1/16 of an inch deep, and fifteen hours 3/32 of an inch deep, we would think we have a rule of time when the iron is compact, and the hardening medium equal to raw bone in carbon contents, that would enable us to intelligently harden iron to any depth desired, or best suited for purpose intended, making proper allowance of time for heavier iron, such as guides, crosshead pins, etc. I would ask this question: If one square inch of iron hardened to a depth of 3/32 of an inch shows 34 per cent of area hardened, and a gain in tensile strength of 8½ per cent, how deep can we harden a guide before its original tensile strength begins to depreciate? I will not answer the problem myself. It is for you; but I will say, you can harden a guide with a sectional area of 15 square inches to a depth of ⅜ of an inch and still retain 66 per cent of area not hardened, as in test No. 4, which shows 8½ per cent per square inch in favor of case-hardening.

The three test pieces, with tabs on them, numbered 10, 11 and 12, are common Merchant bar iron. They were all heated together for 18 hours, for the purpose of testing the virtue of annealed case-hardened iron. No. 10 was quenched when taken from the furnace; No. 11 was allowed to cool in the atmosphere, reheated and quenched; No. 12 was quenched when taken from the furnace, reheated and annealed in dry ashes, heated again and quenched, showing no depreciation in penetration or degree of hardness, but the hardened part has been refined very perceptibly. This would indicate that iron case-hardened to a considerable depth, and having passed through service that necessitated its re-machining, could be annealed, and after being trued up could be reheated to a low shade of red, and quenched, thus avoiding the necessity of adding more carbon, at the same time lessening the danger of the iron springing or winding, which we frequently have to contend with in case-hardening iron, as it requires a higher degree of temperature to qualify iron for absorbing carbon than it does to harden it in water after the carbon is absorbed. This is a scientific fact.



GEORGE LINDSAY, B. & T. H. RY.
G. H. JUDY, PRESSED STEEL CAR CO.
BENJAMIN BURGESS, C. & E. T. RY.

If the subject had been "Hard Cases" instead of Cases Hardened, this paper might have been more interesting, but through fear of implicating the writer, I close the furnace. A. W. McCaslin.

Four Up-to-date Workshop Recipes.

The following recipes are recommended by practical and experienced men:

Hardening and Tempering Steel.

To one gallon of common fish or whale oil, take one pound each of beeswax and resin. Put into a kettle and heat till it comes to a boiling point, stirring it once in a while. When thoroughly mixed it is ready for use.

To harden in this solution, heat the steel till the scale rises a little, then immerse in the oil. When cool, heat over a clean fire till cherry red in the dark.

The foregoing, with a little practice is recommended as one of the best, if not the best, compositions for hardening steel tools for use in cutting iron or wood, or even steel. Care must be used as to the amount of resin in the oil, as resin hardens the steel, whereas beeswax and tallow toughen it. If a person prefer to temper in daylight, clean the steel or tool, polish it, and draw to a deep straw color, if for cutting iron or steel, and purple if for wood-cutting tools, such as plane irons, cutters, etc. With this composition, 'tis said, a better temper can be had for wood-cutting tools than with any other composition.

Cleaning Belts.

The next recipe gives a method of

cleaning belting, as given by the Garnet Belt Dressing Company.

Either secure a tank with tight cover, or simply take a good strong barrel and

THE SPICK-AND-SPAN ESTABLISHMENT RUN BY MR. JAY B. BAKER.—THE PRIZE PICTURE.

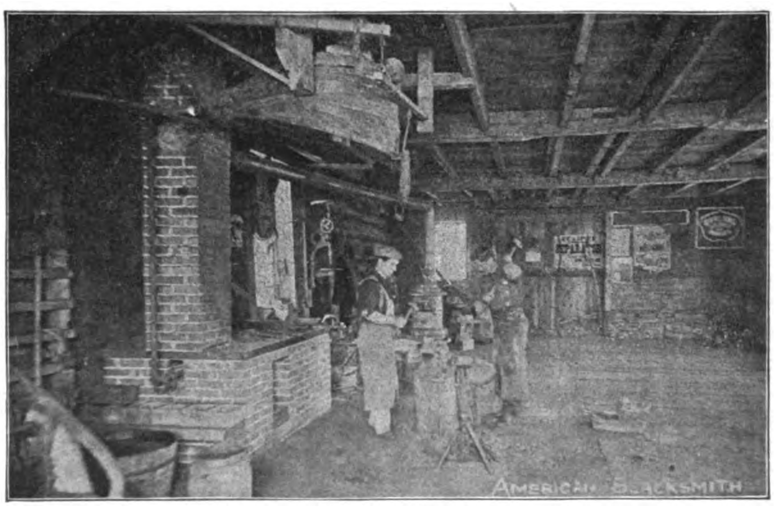
saw it in two. Then place in tank or half-barrel, about ten gallons of naphtha—a tight covered receptacle saves evaporation. Take a dirty belt, regardless of amount of dirt, oil or cement and old dressing plastered on it. Coil the belt and place on edge (not on face) in tank, seeing that there is sufficient naphtha in tank to completely cover belt. Allow the belt to remain in this position about ten or twelve hours, then turn it over on opposite edges, allowing it to remain in the naphtha for the same time, or according to the dirt that is to be removed. Placing the belt on its edges allows the dirt to sink to the bottom, and, at the same time, the naphtha to touch every part of the surface. Remove the belt from the naphtha, allowing the naphtha to drip back into the tank. Lay the belt flat, stretching or shaking until almost dry. The naphtha will not affect the cement at the centre of the belt, but at the edges it will open a little. The old cement should be all scraped off, and the belt re-cemented. Next, place in a press to secure well. Anybody with a knowledge of belts knows how to cement and glue. Do not place the belt on pullies while hard, but rub it with the best material for softening and preserving leather. While dry the belt will readily absorb such material and become flexible and soft. Next use a good belt dressing.

Old belts may thus be restored to usefulness. Any man capable of looking after belts will be able to recement them.

To Cement Rubber to Leather.

It is sometimes required to cement rubber to leather. The following is a good way:

Roughen both surfaces with a sharp glass edge, apply on both a diluted solution of gutta percha in carbon disulphide and let the solution soak into the material. Then press upon each surface a skin of gutta percha 1-100 of an inch in thickness, between rolls. Unite the two surfaces in a press that should be warm but not hot. In case a press cannot be used, cut thirty parts of rubber into small pieces and dissolve



INTERIOR OF SHOP OF MR. NORMAN B. BIE, FORESTVILLE, N. Y.

it in 140 parts of carbon disulphide, the vessel being placed on a water bath of 86 degrees Fahrenheit. Melt ten parts of rubber with fifteen parts of rosin and add 35 parts of oil of turpentine. When the rubber has been completely dissolved, the two liquids may be mixed. The resulting cement must be kept well corked.

To Prevent Rusting.

An excellent recipe to prevent rust, is as follows: Dissolve one ounce of camphor in one pound of melted lard. Remove the scum. Mix as much black lead with the lard and camphor as will give it an iron color. Clean the machinery well; smear with the mixture. After twenty-four hours rub off. Clean and polish with soft cloth.

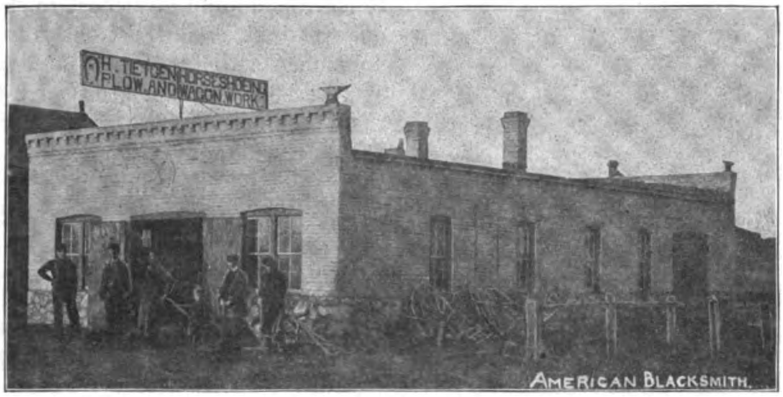
Points on Brass Moulding.

BY B. E. B.

A common way of building brass furnaces for melting in crucibles, is with a cast or wrought-iron casing, 18 or 20 inches in diameter, and about 36 inches high, placed over an ash pit, through which the air is supplied. The casings are lined with fire brick. A small hole about 6 inches square is left near the top and connected with the flue leading to the chimney.

Regarding the actual moulding of brass, there is not a great deal of difference from casting iron. For larger castings in dry sand and loam, exactly similar moulds are made, but for very light castings in green sand, it is necessary to have a very fine silex sand, which contains a slight portion of clay. When sand contains clay in excess, it favors the production of the finest work, but there is always danger of blown spots when this is used, only to be remedied by drying the mould or by introducing more open sand to permit the gases generated at pouring, to escape. It is not necessary to cast brass any hotter than will result in clear, sharp outlines in the casting.

As a rule, most brass castings will be freer from honeycombs if the metal is forced in at the lowest part of the mould, care being taken to provide suitable vents for carrying off the gas generated.



A FINE SHOP, RUN BY MR. HENRY TIETGEN, DETROIT, MICH.

Conclusion of the Shop Picture Prize Contest.

Last spring we offered a prize for the photograph of the shop "standing nearest the high water mark of excellence." This condition was further defined as the neatest, most up-to-date, best-equipped and best arranged establishment to be found.

Of the many photographs we received in this competition, some were destroyed in our fire last June, and while in a number of instances we have obtained duplicates, in others we have not. Some of these pictures are of interiors, some of exteriors. Some of the candidates have given no account of tools or arrangement, and some have fully described theirs. Many good pictures had to be omitted on account of lack of space. Altogether, the pictures sent in represent a very excellent state of affairs in the craft. Prosperity and thriftiness as well as progressiveness are very evident on all sides.

Of the many fine shops pictured in our collection, we have chosen a few of those most representative of types—for example, we give reproductions of four exteriors and two interiors.

After carefully considering the various points of excellence of all the various shops and comparing them, the prize has been awarded, though it was difficult to make a choice, to Mr. Jay B. Baker, of Sanitaria Springs, N. Y. The accompanying engraving of this establishment, together with interior plans sent by Mr. Baker, show the spick-and-span, business-like characteristics which distinguish it.

Mr. Baker's shop has two stories and a basement. It is 20 feet by 30 feet, covered with novelty siding, and lined inside with asbestos roofing. The basement is used for a wood-shop and lumber room, and here Mr. Baker carries enough stock for two years' work, so as to have it well dried. The first floor is for horseshoeing and wagon ironing. The upper floor is used for painting and for storing agricultural implements, for Mr. Baker sells machinery, plows, harrows and tools as a side line.

Most of Mr. Baker's tools are made by Wiley and Russel, Green River, Mass. He has a full set of hand tools for wood working, and in the blacksmith shop are a W. & R. No. 22 drill press, a machine for drilling and cutting threads in Neverslip shoes, a W. & R. tire bender, a W. & R. tire upsetter (setting 4 x 1-inch tires) a W. & R. lighting screw plates and emery stand, and also a foot-power hammer, made from an illustration in THE AMERICAN BLACKSMITH. A full line of small tools and a full set of swages are also on Mr. Baker's list. Of forges, he has two, a brick forge and a portable forge, but he finds that one fire, well-managed, will do a lot of work, and is sufficient except in the very busy time. Mr. Baker is about to put in a five horse-power gasoline engine, a bandsaw, planer and cut-off saw, and later, a power hammer.

Another exterior we present is that of the shop of Mr. C. Hall, Jr., McClure, N. Y. This shop is 40 feet by 34, and the owner intends adding 20 feet by 20 to it, and putting in more machinery. The engine shown in front of the shop is a Canfield gas engine, which he has just mounted himself. He has also a Canfield gasoline engine, three horse-power in the shop, with which he runs two line shafts, driving a 16-inch fan blower, wood lathe, iron lathe, emery wheel, drill machine, wood saw and a buzz saw for sizing timber such as sleigh and wagon woods.

A very fine shop is that owned by Mr. Henry Tietgen, of Detroit, Minn. This shop was built in 1901. It is 20 feet by 58 feet in dimension. The work employs three and sometimes four men. The equipment includes a gasoline engine, trip hammer, emery wheels and other tools. In the winter the work is principally shoeing and sleigh work, and in spring and summer it is plow work and machinery work. Mr. Tietgen is a German by birth, and has served three years in the light Prussian Cavalry. He has worked at the trade 33 years.

Mr. Norman B. Bie, Forestville, N. Y., sent us the photographic interior of his shop reproduced herewith. The building is 40 by 24 by 10 feet, and is only a horseshoeing shop.

The other interior is the shop of Mr. Fred Rickert, Lincoln, Neb.

AN INTERESTING PICTURE, SHOWING INTERIOR OF THE SHOP OF MR. FRED RICKERT, LINCOLN, NEB.

Among the many good pictures which, for lack of space, we cannot reproduce, are those of the shops of Mr. Ira A.

Munson, Hoyts Corners, N. Y., Mr. B. B. Mallory, Racine, Ohio, and an interior of Mr. L. C. Noe's shop, Hartford, Ill. These are only a few.

A VERY ARTISTIC PICTURE OF A BUSY BLACKSMITH SHOP—OWNED BY MR. C. HALL, JR., MCCLURE N. Y.

In addition to the prize mentioned above, we offered one for the worst, most tumble-down shop, adequately illustrating what a smith shop ought not to be. The remaining picture is the one that takes the prize. We do not give this blacksmith's name.

We heartily congratulate Mr. Baker as the master of so fine a shop, and also as a successful prize winner. The sender of the other photograph of the Tom Tardy stamp of shop we also congratulate, though we cannot congratulate its owner.

Notes on Preparing the Hoof for the Shoe.

BY M. E. M.

About fitting the *shoe* to the foot rather than the *foot* to the shoe, much has been said; but this question, like every other, has two sides to it. It is only a matter of common sense, that the hoof, which is always growing and changing, should be pared to the proper shape before placing the shoe on it.

Just here comes in the point about which all controversy has been raised. It is wrong to suppose that all hoofs may be made to conform to a certain standard shape, and in trying to make them do so, a great deal of injury is done with the rasp. But judicious paring is a different matter. All that should be done for any hoof is to cut it sufficiently to secure proper proportions. There are scarcely two horses to be found with feet exactly alike, and the farrier must learn to observe the points of peculiarity before attempting to fit the shoe. Then prepare the hoof carefully, for much injury may result from the improper fitting of a shoe to an unpared foot.

A well-formed foot, when ready for the shoe, should present a symmetrical appearance—i. e., when looked at from in front, the two sides of the wall should appear of equal height, the line of the coronet should be parallel with the lower surface of the hoof, and the perpendicular axes of the legs should be at right angles to those lines. The height of the heels and toe should be proportionate when viewed from the side. From behind, the frog should be seen to touch the ground, and the lower surface of the hoof should present a level bearing surface wider than the wall, extending from heel to toe all around the hoof, and within this border should be seen the sole, concave, strong and rough.

If a foot has a naturally long toe, for instance, it is very injurious to rasp it off to give the appearance of a normal hoof, for the rest of the hoof has been formed to correspond and any effort to change nature must end disastrously to the animal. The only thing to be done in every case is to reduce the horn to a shape capable of most easily carrying the shoe, while still retaining its natural shape.

In preparing the foot for the shoe, the instruments required are a rasp, a drawing knife and a toeing knife. The rasp, which is the most indispensable, should be about sixteen inches long, for a short rasp will not permit the farrier to secure a level bearing surface on a hoof. The rasp should be used with greatest care, for a bearing surface may be spoiled by injudicious use of this instrument.

The drawing knife is formed with great skill for the purpose of paring out the concave sole of the hoof. This instrument is now little used, for any farrier knows that the stronger the sole and frog the better for the horse. Of course it is necessary to remove little uneven prominences of horn which are liable to cause uneven pressures or are in the way of a properly fitted shoe. The edge of the wall, for example, may have to be cut to make way for a clip.

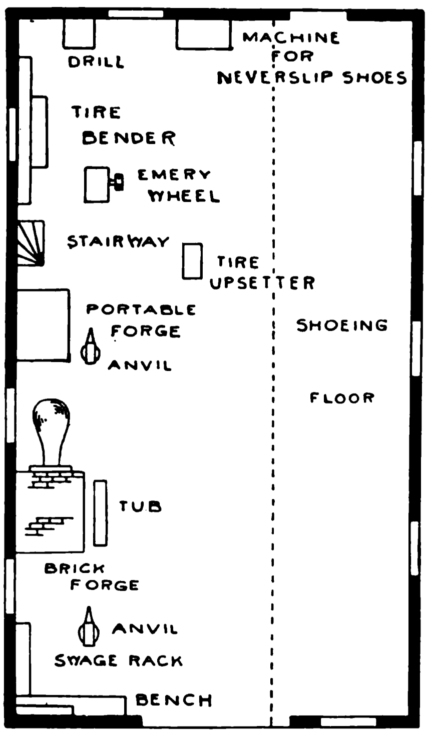
The toeing knife is held and guided by one hand of the farrier whilst, with the hammer, the other hand drives it through over-grown parts of the horn. This knife is not objectionable on the large, strong hoof of the heavy draught-horse, but for light horses or those with

A SHOP THAT MIGHT BE OWNED BY TOM TARDY.

weak feet of thin horn covering, it ought never to be used.

In paring any foot, the greatest care must be exercised. In the natural, unshod foot the friction of the ground wears down high heels or long toes, or other defect of growth, to the proper proportions, but the farrier who knows something of the anatomy of the horse will be able to produce the same effect with the rasp, for, when protected by an iron shoe, the hoof cannot possibly wear down proportionately, hence the folly of expecting to fit a shoe without first preparing the foot.

Another point—if a customer particularly desires his horse's feet shod in a certain way, or prepared in a certain way, do not openly fly in the face of his fads, but try indirectly to persuade him of the folly of his idea. A little tact in this way will often win a man to the right conviction, whereas if you refused flatly to do as he wished, he would probably take his horse elsewhere.



PLAN OF MR. BAKER'S SHOP AT SANITARIA SPRINGS—GROUND FLOOR.

Some Prices from Tennessee.

J. A. GRAY.

Setting wagon or buggy tires.....	$ .50
Filling wagon wheels.....	$2.00 to 3.00
Buggy wheels............	2.00 to 3.00
Shoeing a horse all around with plain shoes..................	1.00
Shoeing a horse all around with toes	1.25 to 1.50

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

How to Melt Brass—I would like to ask some brother to tell me how to melt brass and cast it. JOHN S. SCHAEFER.

A Hopping Horse—Will some one please inform me how to stop a horse from hopping? I have tried several remedies and all have failed. S. W. SALISBURY.

A Drop Forging Query—I would like very much to hear from someone in regard to drop forging hand hammers—what kind of dies to use and how they are operated. BART JOHIE.

Wood—In answer to Mr. John Tieking's question, would say that the holes get smaller when the wood is dry. At least the wood of our neighborhood does.
O. W. TAYLOR.

A Question on Wood Axles—I wish some brother would tell me through these columns the proper way to work wood axles, so as to get the proper gather and pitch by gauge, without guess work and trying in the wheels. J. R. MCDONALD.

Method of Removing Old Spokes—To remove old spokes from hub, I notch the spoke on top, set a stick on the floor under the notch and then with the hammer hit a few smart blows at the notch and the spoke will draw. G. H. RICHARDS.

A Chain Puzzle—The following puzzle may be new to some smiths, and if so, may cause them to do some thinking.

A man carries five pieces of chain, each of which is composed of three links. How can he put the parts together in a straight pulling chain with only three cuts and three welds? S. W. SHORT.

A New Shop—Lee Richardson & Company, Vicksburg, Miss., intend to construct at once an up-to-date repair shop, where they will do blacksmithing, horseshoeing, wood work, painting, etc., of all kinds, and ultimately work into the manufacturing of light spring wagons, buggies, etc. The lot on which they intend to build is 300 by 100 feet. ED.

Interfering—I have several horses to shoe that interfere very badly. These horses interfered before they ever had a shoe on, and I wish that some one would give me the best plan for shoeing horses of this kind.

I also have a pacer that throws his toes out, and strikes the left front foot with the right hind foot under the fetlock. Will some one give the best plan to prevent the action of this horse? D. W. CRYCE.

Self-Sharpening Calks—Having seen on several occasions articles relative to a self-sharpening horse calk, I would say that such a calk has been made by a well known factory, but said factory was asked to discontinue, the horseshoers being very much opposed to such an article, as it dispensed with so much of their earnings in winter time. A PRACTICAL HORSESHOER.

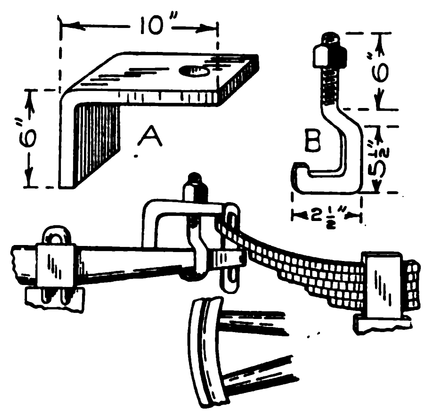
To Harden Files—I harden files as follows: Dip the file in red hot lead, handle up. This gives a uniform heat and prevents warping Run the file endwise back and forth in a box of salt water. Set the file in a vise and straighten it while still warm. Apply water to the part straightened until cold, and you will have a good file. ED. MARSH.

Shear Handle Funnels—I would like to know where I can get funnels which are used on factory tobacco shear handles. I make a number of shears each season, and have to buy fork handles and saw them to the length I want them and put the funnels on again. If I could buy the funnels, I would have the handles turned and save a great deal of work. Can some one give me this information? O. W. TAYLOR.

Welding Heavy Tires and Axles—First get a good coke fire. After placing your iron on the coke, put across the fire a piece of pine board one inch thick by four or five inches wide, cover your iron with three inches of green coal, wet down, blowing up slowly. Leave a hole in the front so that you can watch your iron and you will be surprised to see what a nice clean heat you will have. If you have to take a second heat, don't break up your fire, when taking out the irons, and you will have a good fire for a long time. MICHAEL LAMB.

Tempering Steel—In answer to B. I. Davis in the August issue as to tempering steel, I will give my experience as I had the same trouble. If I have no charcoal, I coke my coal, and if bad coal, I wash it first. Then sharpen and temper in one heat. Plunge the temper at a dark red for hard steel and cherry red for machine steel. I let my machine steel cool before tempering, as bits are liable to break off. For flint rock, I use cyanide of potassium in water. FRED RICKERT.

A Handy Tool for the Round House—In the round house, there are many new springs to be put in, and also there are engines which are low in the front, back or one side. This, as every one knows, is quite a job, and to help the machinists in our shop, we made the tool which is shown in the accompanying illustration. Every smith



USEFUL TOOL FOR LOCOMOTIVE REPAIR WORK.

will understand its use and operation from the drawing, and can make one. It is placed on the equalizer and spring, and by tightening up the nut pulls the equalizer up and pushes the spring down. This is a good device we think. C. C. HENDERSON.

Warping—In case hardening links, particularly those of the solid kind forged from wrought iron now being somewhat extensively used on locomotives, I find that they do not retain their shape after

being case hardened. They convex on the block faces, starting from a point about one-half an inch from either end and increasing toward the center. I have known them to convex $\frac{1}{32}$ of an inch on both faces. This condition also exists on old links which have been annealed and trued up and hardened. I find this also in sectional links, but not to such a pronounced degree as in the solid kind. Can some one enlighten me as to the cause and remedy of this trouble? GEO. FROST.

One Man's Method—In my methods, I am neither old nor new-fashioned. I heat my steel slowly and often where much forging is done, and draw my temper in oil, grease, water or brine, as the work of the tool requires. About once in five or six years I miss a temper. I always heat back well and dip only a little farther than temper is needed in the tool. In this manner I manage anything from the heaviest oil well tools to three-fourths inch cold or chipping chisels or less. Light tools I harden and draw temper over fire after the old-fashioned method.

In my line a man is called on to do anything from making a pair of 300-pound drilling jars to putting in a set of boiler tubes, and this generally with a fire made in the ground. L. R. SWARTZ.

Springing When Case Hardening—Relative to engine motion links springing out of true, will say that I do not think the carbon or case hardening has any part in such trouble. They would spring equally as much, if heated red and quenched without being case hardened at all. In fact it would only be once in many times, should we heat a piece of straight iron red and quench it, that it would remain dead straight and true. We, as blacksmiths, worry over these contraries, yet the fact remains, that iron and steel will spring in quenching. To avoid as much as possible this trouble in engine motion links and in all work requiring case hardening, I will mention four essentials. First, uniform heating for forging; second, uniform heating for annealing; third, uniform heating for quenching and fourth, dip on end, and quickly that the bath may cover all parts of the work at once.

Engine links, or any case hardened work may be heated to the limit of black hot and straightened under a press. Such is general practice. A. W. MCCASLIN

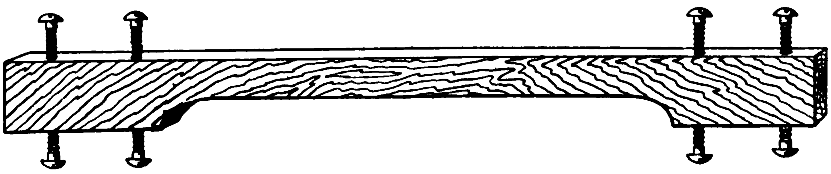
A Good Tire Bolt Holder—I should like to give my method for making a tire bolt holder, which we have been using with much success. Before I made this tool, we had a great deal of trouble in getting the tap from loose bolts. But when a fellow gets worried with such, if he has any wit, he will put it to work and try to invent a new scheme so that he can do his work much more easily and quickly. Take a piece of $\frac{1}{2}$-inch round iron. Bend one end back in the form of a hook 2$\frac{1}{2}$ inches deep, 2$\frac{1}{4}$ inches wide and 1$\frac{1}{2}$ inches deep from the bend of the handle. A stud of tool steel is welded on 1$\frac{1}{2}$ inches from the bend and is $\frac{1}{2}$-inch long after welding. File this to a bevel edge, harden and draw to a blue temper.

To operate the tool, put it on the wheel, with the stud on the bolt head and the left knee on the lever. With this device I have held bolts tight enough to twist them off. I am the son of a blacksmith who takes THE AMERICAN BLACKSMITH, so I think I am justified in trying to help make it more interesting to its many readers. C. M. JACKSON.

Shrinkage of Green Wood—In regard to Mr. John Tieking's question in the August issue, I am glad to inform him that I have had considerable experience in house-moving wheels. To be sure when the wheels shrink, the holes would naturally be smaller. If nothing was inserted in the hubs to prevent it, they will shrink and tighten on the boxing. But give yourself no uneasiness about the boxing breaking. As the pressure is even and alike all around, it would be almost impossible to get pressure enough to break the boxing that way.

The following is one of my experience. In 1895, I built a large wagon out of the same sized wheels, only I used sycamore. This wagon was for use in hauling a crusher for the Kansas City Boiler and Construction Company. The road crusher was said to weigh eighty tons. This wagon was built out of green wood. I was called on to do some more work for them in two years and the wheels when I examined them were in good condition, the thimbles having become loose from shrinkage of the green timber. I have had many similar cases come under my notice. At this time of the year the sun is generally very hot, so that I would advise you to paint the sides of the wheels to prevent seaming and cracking and it is little trouble. M. A. FOSTER.

Simple Axle Set—In answer to E. A. Lockhart's question in the June number would say take a $\frac{7}{8}$-inch board and cut out for bent axle. The top screws are for the gather line. Three of the bottom screws are on line and the end screw a scant $\frac{3}{16}$ of an inch less. I have used this set for years and find it just as accurate as any other. Of course, the screws may be adjusted to any desired set. J. S. STEELE.



INGENIOUS DEVICE FOR SETTING AXLES.

Handling Vicious Horses—I paid ten dollars to learn the following way, and will give it to my brother smiths for what they think it worth. If they will write to me and ask for information, I will be glad to write to them. In handling vicious horses the first thing to know is that you can do more with kindness than by abuse. If I have a very bad horse, I get a $\frac{3}{4}$-inch cotton rope, twenty feet long, tie it around the neck, bring it forward, pass it through the mouth over the upper gums, then over the head just back of the ears, down the side of the head over the gums again, and back through the rope on the neck. Now if he resists you jerk him; if he minds you pat him. Pick up the foot, not forgetting that there is more in kindness than abuse, handle the foot a few times, then go all around him the same way for you must break each foot. Do not try to hold him by the foot, that is the old way of shoeing. Drive a nail and let the foot down. Take your time, and I will assure you that you will never fail. I learned this twelve years ago and have never failed yet on horse, mule or pony. I have not used the rope for several years. I just use the bridle hitching strap. Take the rope or strap back to the hind foot and wrap it around the pasterns of the foot two or three times and he cannot kick you, try as he may. J. A. DELONG.

Putty—Will some one give me directions for making a putty to fill up joints on wrought iron frames for fancy doors? The ordinary putty will not harden and remain in the joints. I. PETERSON.

In Reply—A very good recipe for repairing damaged places in cast-iron tanks, cisterns, etc., is to melt together five parts brimstone, two parts black lead and two parts cast-iron filings (previously sifted). In melting, take care not to allow the brimstone to catch fire. Have the damaged place perfectly dry and heat well by placing a piece of red hot iron upon it. Heat the cement in a melting ladle till it becomes soft and apply to the hot surface.

Another recipe recommended to make a permanent and durable joint between rough cast iron surfaces is as follows: Mix asbestos with a quantity of white lead sufficient to make a very stiff putty. This putty will resist any degree of heat and is not affected by steam or water.

Still another putty or cement may be made by mixing coarsely powdered iron borings (5 pounds), powdered salammoniac (2 ounces), sulphur (1 ounce) and water sufficient to moisten it. This cement hardens rapidly, and if time can be allowed, it sets more firmly without the sulphur. It must be used as soon as made, and rammed tightly into the joint.

In all cases see that the surfaces are absolutely clean, and bring the cement into very close contact with those surfaces.

Painting Blackboard—Will some one kindly tell me how to paint a blackboard? I have painted several, but the chalk does not rub off easily. GEO. E. BRIERLY.

In Reply—Regarding the painting of blackboards so that chalk will rub off easily, the following recipes will be found practical and useful. It may first be remarked, however, that many boards are found difficult to clean off for, say, a fortnight after first using them; then they become all right. Prepared chalk will rub off best.

Paint the board with ordinary black paint that dries glossy, then give it a coat of lampblack mixed with turps instead of oil. This will give a dull, dead black.

2. Soak one-half pound of logwood twenty-four hours in sufficient water to cover it. Strain and apply to the board boiling hot. Boil the solution again, and apply a second time as before, letting the board dry in the meantime. Dissolve one-fourth pound of copperas in about one pint of boiling water and apply it boiling once or twice, as necessary to secure the required degree of blackness. Rub over with rushes, straw, ferns or shoemakers' heel ball before using.

3. Heat one-fourth pound of lampblack on a flat piece of tin or iron until it becomes red. When sufficiently cool crush it with the blade of a knife on a flat board, quite fine. Mix with one-half pint of spirits of turpentine, and apply the mixture to the board with a size brush. On a new board it may be necessary to give one or two coats of unburnt lampblack mixed with boiled oil, adding one-half pound of patent driers. Then apply the burnt lampblack and turpentine very quickly.

4. Mix soda silicate (water glass) with an equal bulk of water, and add enough lampblack to color the mixture. The lampblack should be ground and mixed with a *little* of the water and silicate before adding the whole of the liquid. E. E. M.

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Regarding Our Advertisers.

The "Honest Dealings" paragraph is printed in the advertising columns of THE AMERICAN BLACKSMITH, every issue, and guarantees the reliability of all firms whose announcement there appears. Our readers can depend upon it that our advertisers are all responsible houses. Advertising is not accepted from any other kind.

Readers can do the publishers of this paper a great service by mentioning THE AMERICAN BLACKSMITH whenever they write to any advertisers. We shall always endeavor to protect our subscribers from unscrupulous firms, and in turn would much appreciate it if our name is mentioned when any of our advertisers are communicated with by readers.

A Special Long Time Rate.

Believing the time has come with the beginning of this volume to favor our regular subscribers for their support of the journal, we have adopted a schedule of subscription rates for two or more years at a reduced price. Our subscribers know the value of the paper, know that it is a fixture, know that the publishers desire to cater to their wishes, and hence they will appreciate the saving which the new schedule will enable them to make by paying for several years' subscription at one time. These rates will be found on one of the advertising pages of this issue.

We can afford to make these discounts on account of the saving which it means to us in not being obliged to send a notice of expiration each year and to go through the clerical work of crediting each subscription as it comes in yearly. We already have a number of two, three and even five year subscriptions on our books, so that we believe our friends will be glad to take advantage of the special offer above referred to.

Special Contributions of Unusual Interest to Horseshoers.

The many readers of THE AMERICAN BLACKSMITH among the shoeing craft will be glad to hear that a series of articles upon Interfering has been arranged for from the pen of the well-known authority, Mr. E. W. Perrin.

Interfering in its many phases, presents one of the most interesting yet difficult problems with which the farrier has to deal. A practical treatment of this complicated subject by a man of deep theoretical knowledge and wide practical experience, will be found of great interest and value to our horseshoers. The first article of the series is to appear in the December issue. THE AMERICAN BLACKSMITH is very glad to have secured these articles, as there have been numerous requests from readers for information on this topic.

Carriage Repairmen's Prize Contest.

The prize article contest announced in last issue is still open. This is a chance not to be missed by any reader of THE AMERICAN BLACKSMITH whose work is in the carriage repairing line. The contest closes December 12.

Remember that ten prizes are to be awarded for the ten best articles on carriage repair work. We have already received some very good ones, but we feel that many of our ablest craftsmen have not yet responded.

Our object is to secure the most useful, practical information obtainable upon the subject. Another thing to be borne in mind is that the prizes will be awarded according to worth of the articles, without regard for spelling, writing or such points. If you have any ideas at all in this direction your chances of securing a prize are good.

Send in your article as soon as possible, for remember this contest closes on December 12.

Jobs That Clash.

A great many smiths, when they promise to finish a job by a certain date make some sort of mental note that it is to be done by such and such a day—and that is all. Another piece of work comes in which is promised for another date, and so on. The man who could keep all these dates and items in his mind without confusion or forgetting any would be little short of a genius. The trouble is that the average man is not capable of this great mental exertion, and many patrons are disappointed, either because the smith has forgotten or is unable to fulfill the numerous promises all made thoughtlessly for the same date. By this carelessness, many good patrons may be lost, and the smith's reputation for promptness and reliability is soon gone.

All this might be avoided by the simple use of a system of memoranda. By reference to such, the busiest smith can tell at a glance just where he stands, and how much work he has on hand. He will not promise that Jones' tires will be set by Tuesday if he sees that already he has enough work on hand to keep him busy till Wednesday without touching Jones' job.

It is an excellent plan to cultivate the memory, but not at the expense of waiting patrons. Besides, any methodical establishment, in these days of system, should have books to show all information of every description connected with the current business. Such system may

be of the simplest description—merely a collection of neat, methodical notes, or it may be elaborated to a complete set of books.

The Fate of Photographs.

Many contributors, when sending photographs, ask us to return them after printing. We are always very willing to do this, but it should be remembered that the picture, after going through the various processes of reproduction, is often unfit for anything but the waste basket.

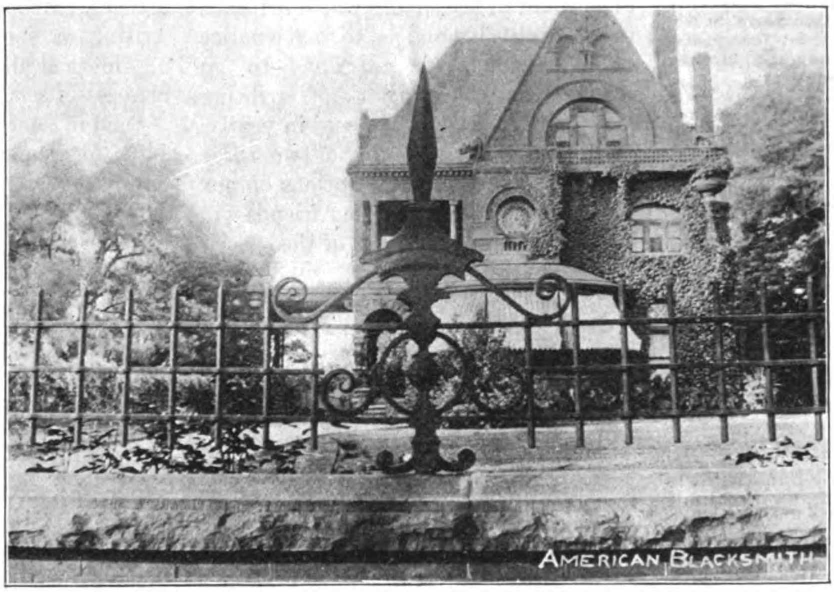
In the first place almost all pictures received must be "retouched," i. e., the surface must be touched up with paint to bring out the sharpness of outline that is always more or less diminished in printing. Secondly, the *whole* photograph is seldom available, so that a margin of varying width must be pencilled in, and dimension lines and figures as well as an imprint placed on the picture. Lastly, the photograph undergoes considerable wear and tear at the hands of the engravers, and all things considered, the wonder is that there is anything left to tell the tale when all hands have finished with it.

If your photograph is late in arriving or fails to arrive, or if it reaches you a disreputable wreck, please bear in mind the above facts, and try to believe that we have done our best to return it to you in good condition. We fully appreciate the fact that many of the pictures sent us are of peculiar value to their owners, for in many places it is no easy matter to obtain a picture of the shop. However, though you may not have the original, you always have the copy as presented in THE AMERICAN BLACKSMITH.

Two Very Good Examples of Buffalo Iron Fences.

Buffalo once more yields specimens of ornamental iron work that are both unique and beautiful. Unfortunately the pieces are somewhat old, so we have not been able to secure the names of the forges from which they have emanated. However, ideas may be had from them, in the line of designing for wrought iron. All three engravings are from photographs of fences—or, more correctly speaking, they are from two different fences. The first two pictures show views of the same piece, the one in detail, the other a general aspect. The spear points alternating with the points in leaf effect are very pleasing while the series of plain straight lines between the posts form a happy relief to the more fancy portions. The remaining cut shows an exceedingly effective fence and gate. The hollow box posts are here worked in to good advantage. This style of fence always suggests utility rather than ornament, the spikes on the top giving the impression of menace.

The best effects in wrought iron are sometimes secured by simplicity. It takes a master of design to work out complicated ideas to advantage, however attractive these latter may be when done.



DETAIL OF SPEAR-HEAD DESIGN SHOWN IN FENCE.

Timely Talks on Carriage Repair Work.—2.

A. J. YEAGER.

Welding Carriage Springs.

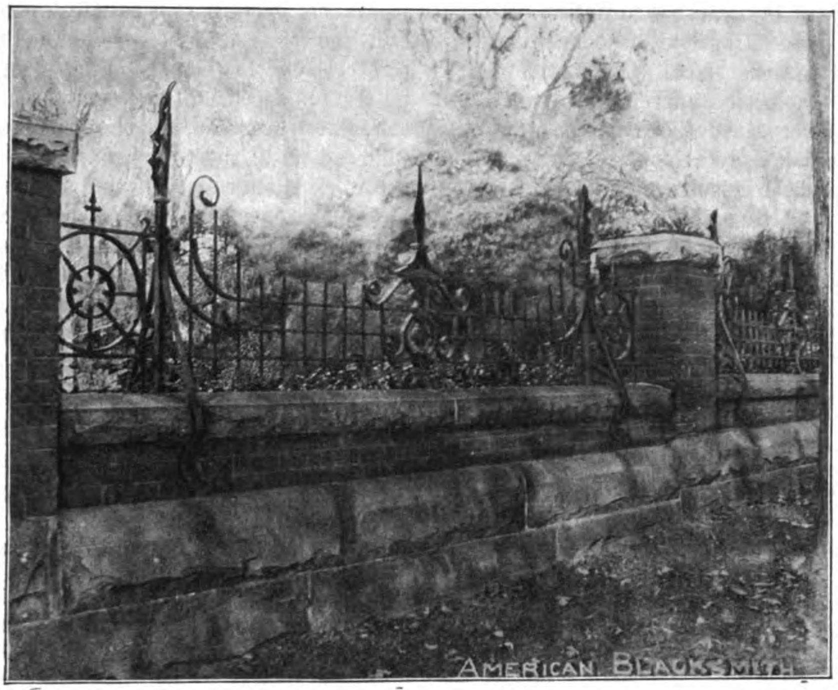
Having explained my method of treating carriage axles both as to welding and setting, we shall now proceed to repair carriage springs. This is the part of carriage repairs that will at times wrack the brain of the best mechanic in the world. I shall first give to your readers my way of welding springs. I have tried, I think, about all the ways there are. I take the pieces and scarf them to a point by hammering them on the sides and scarf the end down to a thin edge, using Cherry Heat welding compound freely on the sides that are to be put together when welding takes place. I take separate heats on the pieces, and when I am ready to weld, I have the helper strike on the parts to be welded. In this way I never miss making a good weld, as the adhesion takes place from the centre out towards the edge and when the weld is finished up it takes an expert to tell where it is. I have had very good success in making springs stand up in welding them this way. Understand that I do not advocate the welding of carriage springs as a general thing, for they will often break again in or near the weld. But sometimes we are placed in such a position that we have to weld them. I always advocate new springs where I can get them, but we have so many different kinds of springs and also so many different styles that it would sometimes puzzle a Philadelphia Lawyer to find a duplicate spring to replace some that come to be repaired.

I have in view a job that came to my place to be changed over to an easy riding wagon, as the fellow expressed it. The description of the wagon is as follows: ¾-inch tread wheels; 4-foot track; body 16 inches wide, 56 inches long, side bar hung on one and two plate Brewster springs, and only two of those—none at the ends of side bars. It was a one-passenger wagon used by a veterinary surgeon, and was shipped from Long Branch, N. Y., to South Dakota. Of course there was no give to those springs, and it had on steel tires which did not make it ride very easy. Now one of those springs broke and the owner wanted something on the wagon that had some spring in it and would ride nice and easy. This was a puzzler,—how to make springs ride easy and only a space sixteen inches long to do this in and to carry only one person at that.

Now for the benefit of AMERICAN BLACKSMITH readers and for the carriage repair men in general I will explain how I repaired this job so that it suited my customer, and he got just what he wanted.

I took a one-half set of Thomas coil springs and cut each in two. I then cut them off at the end where the eye is turned and shortened them up to the length needed, then turned new eyes on

them and used them singly. In place of having two coils on the side I had only one. I turned the end that bolts on body and turned them at right angles



A VERY ATTRACTIVE BIT OF IRON FENCE—ENCLOSING A BUFFALO RESIDENCE.

about three inches to make the bearing come even as nearly as I could over where the spring hung under the side bar. I then bolted springs to the body, first making blocks to fill between sills of body, and bolting through both with one bolt and one bolt clip. This completed the job, and it did just what the doctor ordered.

(*To be continued.*)

Hanging Up a Platform Spring Wagon.

L. VAN DORIN.

If you will kindly indulge me with a little space in your valuable journal, I will try to tell how I hang up a platform spring wagon—I saw a self-made smith recently trying it and he had so much trouble, I thought I would tell the craft my way. There are so many such wagons built now-a-days and they are very awkward to hang unless done in the proper way, and then they are easy.

When the body is ironed I lay it upside down on two trestles, then put each gear in proper place on the body, and put the wheels on the axles. Now measure from bottom of body to a straight edge placed on wheels. You will then see how deep to make the top platform to make the wagon hang level. After the top platform is made and bolted on body, then line up hind axle from king bolt hole and bolt hind gear to body. If the job wants a brake now is the time to put it on as well as the rub or wear irons. It is so much easier doing all these things, while upside down than to crawl under the wagon to do it. When the job is turned rightside up it is about ready for the paint shop.

It is said that a hint to the wise is sufficient, so I have just hinted at how to handle a platform wagon at a point in the stage of construction that is liable to give some smiths trouble. The wood worker has been getting much instruction lately on platform gears, but the poor blacksmith is left to work out his own salvation. I hope this may interest some of the boys.

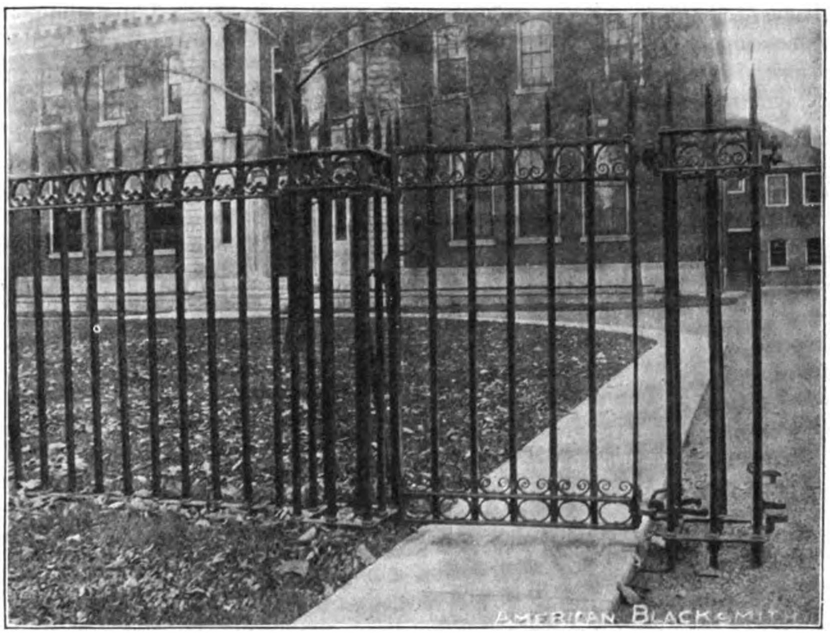
Notes on Boiler Flue Work.

BY ALLAN.

The blacksmith is very often called upon to put new flues into boilers to replace those which have become leaky or otherwise defective, and the progressive smith will always know how to go about the work when it presents itself.

In the first place, to get the flue out it must be cut off at each end just inside the crown sheet or boiler plate. A simple but serviceable tool for this purpose is made by taking a 12-inch piece of steel about ½ by 1½ inches, bringing one end down to a sharp chisel point, and then making a right angled head of just sufficient length to allow it to enter the tube and bring the cutting edge to the proper point. A good leverage may be obtained by using a piece of pipe for a handle to the tool. The cutting edge should be hardened and drawn to a dark yellow.

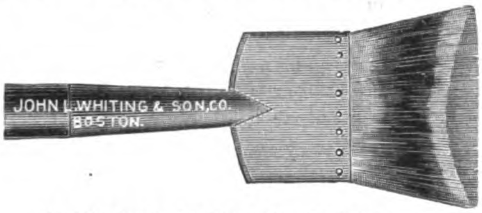
Having cut out the old flue or flues, the next step is to cut off as much as may be defective and prepare to weld on a new end to make the tube long enough. To do this, clean the ends to be welded thoroughly—an old rasp being handy for this purpose if there are no better facilities. Scarf for a lap weld, driving the scarf of the new piece on over the old. The weld can be made with the tubes in the fire, turning and striking lightly till welded. Borax is good as a flux.



A NEAT, PLAIN STYLE OF WROUGHT IRON FENCE.

While the hammering is being done, a mandrel or rod should be inside the tube to preserve the shape, and it will also be found useful to put up some kind of a stop to push the end of the tube against and prevent pulling apart. The best results on this kind of work are to be had with welding machines and oil or gas fires, but the job can be done in an ordinary forge with a coke fire. Whenever possible the weld should be tested.

The welded tubes or the new ones, as the case may be, are then cut to length, allowing in the neighborhood of $\frac{3}{8}$ inch to extend beyond the sheet. Place in the boiler and expand the ends snugly to the boiler plate, for which purpose a roller expanding tool is the best. The next operation is to turn back the ends and bead or calk them up tight with boot or calking tool and hammer.



EXAMPLE OF BADGER-HAIR FLOWING BRUSH.

The Process of Polishing Steel Tools.

Grinding is the first stage of polishing. For flat surfaces large grinding stones may be used, but for grinding small articles or concaved surfaces, like razors, small ones are required. While grinding, keep the stone wet with water and revolve *away from* the operator. It is very important that grinding stones should run true. Truing them is termed "hacking," and may be done as follows: Run at a speed of one hundred revolutions per minute. The operator rests his hand upon the saddle and holds a piece of coal or chalk in contact with the wheel, just so that it will touch the highest points. Marks will thus be left upon the high points, and these may be levelled down until the surface is uniform. Having ground down the outside surface of the tool, the next step is to polish it.

Polishing wheels are made in sections of wood, such as pine, well seasoned. Fasten the sections together with glue and wooden pegs instead of nails, and allow to stand two days before turning. Next cover the circumference with sole-leather one-fourth inch thick. Do not harden the leather by hammering but put it on soft, flesh side to the wood. Make the joint diagonally across the circumference with a chamfered edge. Apply the work so that the action tends to smooth the joint down rather than to rub it up. The wheel may be slightly soaked in water before putting on the leather, then apply the glue very rapidly, bind the leather around the surface quickly and secure it until firm. Emery No. 60 to 120 or flour of emery is used for coating the surface. One way is to glue the whole circumference and roll it in the emery. Another way is to glue only a portion (say a foot) at a time, while the wheel is suspended on a shaft or mandrel, then apply emery to the glued portion, pressing it tightly on by means of a board. The board should be slightly wider than the wheel and rocked from end to end upon the surface. The coarser grades of emery perform a cutting function as well as a polishing. A good machine-finish is secured by the finest emery, while for a fine polish or glaze, emery flour is necessary. The process of burnishing consists in rubbing down all minute roughnesses by a highly polished steel or agate tool—no metal being removed. The harder the material to be burnished the brighter will its final luster be. A burnisher of hardened steel is harder than almost any other metallic body. The degree of luster obtained depends also upon the pressure applied and the intimacy of contact of the burnisher. The burnisher polishes only those surfaces that have been rendered smooth already. A file mark or scratch will not be removed by burnishing but only polished up in detail. If the burnisher is pressed too hard the surface is said to be *full of gutters*. The burnisher should be cleaned on a buff stick immediately before using. Apply with least possible friction. To clean a burnisher for steel, use finest emery flour. If rubbed first with oil the burnisher will, in case of most metals, yield best results, but in case of gold or silver this is not necessary.

Buffing may be done by hand by rubbing the metal with soft leather charged with a fine polishing powder. It is more often done, however, by a wheel held in a lathe, the work being placed in contact with it. Crocus and rouge are the best polishing powders for steel and brass. A good rouge powder may be made by exposing very pure, clean crystals of sulphate of iron to heat. The hardest part of rouge must be selected and kept clean and free from dust that might scratch the surface.

To polish in the lathe, turn and file smooth, polish further by fine emery and oil applied with a stick as described above. In the case of rods and cylinders a clamp is used so that great pressure can be brought to bear on the part to be polished. Examine from time to time to see that every part is equally smooth and free from scratches. Should a file scratch be detected, the process must be recommenced at the stage at which the scratch occurred, and the other steps followed up in their proper order. As the work advances, keep applying finer and finer powder, until the required finish is attained. The following is a good recipe for a polishing solution for steel: arsenious acid, $1\frac{1}{2}$ drachms; elutriated bloodstone, $1\frac{1}{2}$ drachms; antimony trichloride, 6 fluid drachms; alcohol (90 per cent.) one pint. Digest at a gentle heat, shaking frequently.

Talks to the Jobbing Shop Painter.—8.

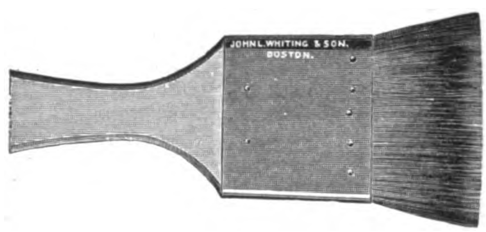
M. C. HILLICK.

The Brush Equipment and How to Care for It.

A reader of THE AMERICAN BLACKSMITH desires to know how to take care of brushes when not in use. He writes:—"I have tried keeping them in water which makes them work like a rag on the end of a stick. Also turpentine which takes all the elasticity out of the good ones.

The best way which I have found is to rinse all the paint or varnish out of them with turpentine and leave dry, but this is quite a "job." In fact, the question of brushes and their care is of such general interest that it has seemed appropriate to devote this month's talk to the subject.

The assertion has passed beyond the limits of argument that in buying brushes the best is the cheapest. Brush making affords an opportunity for the substitution of a large per cent of shoddy and the unscrupulous manufacturer has not been slow to take advantage of the chance to enrich himself at the expense of the consumer without having given value received.



A GOOD CAMEL'S-HAIR COLOR BRUSH.

It therefore behooves the brush buyer to buy the best, regardless of the speech of the just-as-good-at-less-price salesman.

The eminently good brush has a hang,

poise, quality and general usefulness which the shoddy tool is a total stranger to, however fine the manufacturer may have dressed it up for selling purposes.

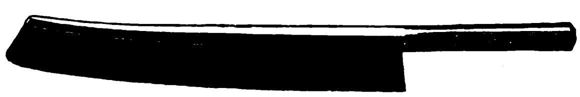
FLAT BRISTLE VARNISH BRUSH.

Coming now to our correspondent's question, and assuming that his brush equipment is first class, it may be said that all paint brushes before use should have a little oil paint dropped in at the heel of the brush and set away, bristle end up, for a few days before using. Round or oval bristle brushes intended for use in the application of lead and roughstuff coats had best be "broken in" putting on priming coats. This gives them additional elasticity and saturates the heel portion of the brush with a percentage of oil that fits it for good service. Such brushes may then be suspended in clean, soft water when not in use, and instead of rendering them to a dishrag buoyancy, the water should keep them elastic, fresh and full of vitality. Camel's hair brushes, when not set in glue, may also be kept in water. All camel's hair brushes, before use, should have a bit of lead, mixed oil and turpentine, equal parts, dropped into the heel of the brush. This will serve to settle the stock more securely and seal all interstices against the effect of water. Brushes set in glue should preferably be suspended in raw linseed oil when not in use. This, of course, necessitates washing the brushes out in turpentine before using, and to the carriage painter it has many disadvantages.

As a general proposition all paint and color brushes, outside of the glue set ones may with entire safety be kept suspended in water when not in use. Suspend the brushes by the handle into the water sufficiently to immerse the bristles or hair completely. Never permit brushes to rest upon the point of the bristles or hair. Change the water often enough to insure fresh, clean water at all times. Store the brushes in covered cans or pails in order to maintain cleanliness. Upon removal from the water give the brush a generous, but not harsh, rubbing out on a smooth board kept in place on the side of the shop wall for that purpose.

All brushes used in color-and-varnish, or clear varnish, either rubbing or finishing, are best kept in varnish, and for this purpose a varnish, minus the addition of driers, should be procured through the good offices of your varnish manufacturer. Varnish keepers, also paint brush keepers, have in earlier issues of THE AMERICAN BLACKSMITH been illustrated, and it only remains to say that if all brushes, after use, are properly cleaned and hung away in dust proof receptacles with bristles or hair immersed in clean water, oil or varnish, as above advised, they should give an entirely satisfactory account of themselves, provided, of course, the brushes have the quality of the thoroughbred at the outset. No amount of skilled handling will suffice to keep the brush of inferior quality in workmanlike shape or condition.

Brushes should never, under any circumstances, be kept in turpentine. To keep brushes in good condition they must be cared for properly. Good brushes are rendered useless by careless



CONVENIENT FORM OF LONG HANDLE SPOKE BRUSH.

usage, where they might be made to yield the best service with care.

(To be continued.)

The Progressive Smith as a Business Man.—2.

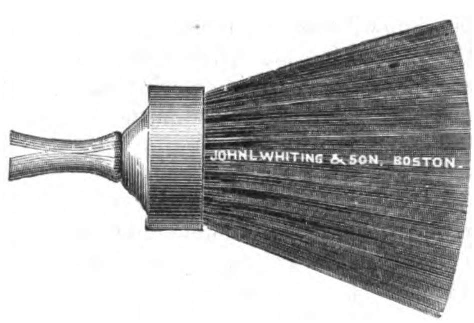
BILLY BUNTZ.

Credit—Giving and Securing.

The progressive smith understands the basis of credit, more especially from his own experience in asking time. The Commercial Agencies show his capital as, say $500, and his credit usually as second-rate, simply because his funds are limited, although he may pay his debts more readily than some firms who are rated at $10,000. Should he ask a manufacturer or supply-house for time they are likely to assure him that they would be glad to extend it were their prices not so low that they were compelled to sell for cash—that it was not a matter of credit at all, simply one of money in hand. Were his rating higher, the smith could more readily obtain credit. "You do not appear to be rated by the commercial agencies!" is the way some smiths are refused credit. As a general thing the smith is little known outside his home town and his ability to pay a debt is judged more generally by the strength of his financial rating, however honest he may be.

The smith may establish confidence among those with whom he deals by having his business friends speak a word for him to agents and supply men. He may have his rating established by visiting his home representative of the commercial agency, and by producing letters from folk who have extended him credit he may be able to convince him that he is prompt in paying his debts. In seeking credit, it is best for the smith to cite his references—the home bank and several prominent business men who know him to be a man of his word. By their permission, these references may be printed on his letterhead. Having a letterhead is in the line of progression because it looks businesslike, whereas to seek credit by scratching a few lines on a sheet torn from a work-book, looks as though the writer had little business ability. Where the smith has a bank account he may readily obtain a letter from one of the bank officials certifying that he does business through their institution and has never allowed any commercial paper to go to protest, and usually has a deposit ranging from $100 to $300 during his busy season. Credit may sometimes be obtained by giving a note endorsed by a couple of responsible men of good commercial rating. Where the smith has funds, but wishes to buy on time, he may give his note endorsed by the cashier of the bank, certifying that a certain amount is held in escrow by him for payment of the debt at maturity.

Where the smith understands the business principles of obtaining credit and the difficulties he sometimes meets in this direction, he is not quick to trust his own customers merely on the assertion, "I'll pay you next month," especially when they are not very well known to him and he doubts their sincerity, so he protects himself accordingly by taking their note with endorsement, or



A GOOD BRUSH TO USE AS A DUSTER.

their produce, rather than trust to any lien or judgment he might be able to get against them should they fail to pay.

The credit business in other lines of trade is on a like foundation, and the

smith may learn much by observing how different tradesmen handle their customers, invite trade, extend credit and obtain it for themselves from supply houses. His grocer, butcher, baker, coal or feed dealer, and others, may teach him methods which he himself could adopt to advantage.

In buying new goods, however, the progressive smith purchases only in small quantities at first, to satisfy himself that they will meet his requirements, regardless of any flowery assurance from the salesman that the goods are exactly what he needs or that he could buy twice as cheap by the carload. In matters of this kind he uses his own head rather than to take things for granted on assurances that he will not regret his purchase. In buying iron, he may agree to give 100 pounds a trial, buying it if it meets his requirements or rejecting it if it does not, which is a proposition entirely fair. Where one house refuses to do this, another may be glad to accept it, knowing that the quality of their iron speaks for itself.

(To be continued.)

Trials of a Blacksmith.

BY ANVIL.

"Good morning John, where do you hail from? Shake. I have not heard from you for a long time, are you still at Flashtown?"

"Yes, Thomas, I am still there, but I wish I had never seen that place."

"Well, well, what's the matter? No work, or what seems to disagree with you?"

"Well, Tom, when I left your employ and hung out my shingle in Flashtown, I thought I would be in clover. The town was surrounded for many miles with well-to-do farmers and I soon had all the work I could manage."

"Well, what's the trouble? Didn't that suit you?"

"Oh yes, that part was all right, but you know I wasn't the only pebble on the beach, for my fellow competitors soon made things disagreeable for me and among the hard-fisted farmers they were more than successful."

"How was that?"

"Easy enough. They simply cut prices so much that I found difficulty in keeping my own and giving honest value for the work entrusted to me."

"In what did they do the most cutting?"

"Chiefly in horseshoeing. They would shoe a horse on all four feet for one dollar for new shoes, and for resetting shoes—they did it for the ridiculous sum of ten cents per shoe."

"And what did you do?"

"I had to follow suit or quit."

"And do you find it unprofitable to work for such starvation prices?"

"Of course I do, and therefore I'm disgusted. When I see the customers, chiefly farmers, getting such good prices for their produce and making money hand over fist, while I must toil on and on and make a pleasant face for a comparative pittance, I sometimes feel as though I ought to quit and go at something else. I could do much better working in some factory or go to the city and do journeyman's work—I should at least get decently paid. What do you advise me to do?"

"Now look here, John, as I understand, your chief complaint is that prices are too low, and you blame your competitors for that. Now, John, let me tell you plainly that it is your fault as well as theirs. The trouble lies in the fact, that instead of you and your competitors being friends, you talk and belittle each other's work, which on being repeated to them causes bad blood. Can you truthfully say that on starting your shop you didn't criticize the work of others and sometimes unfairly with the selfish object of diverting custom from their shops to your own? Answer squarely."

"Well, I admit I did my best in getting customers, but that didn't justify them in cutting prices beyond a point which makes it unprofitable to continue."

"Now, John, as you have told me your tale of woe, let me give you a few words of advice. The experience you have undergone is to me an old story. I have made similar mistakes, but with age and experience comes wisdom and if you will take sensible advice I will give it to you free, gratis. There is work enough for you and all the others in Flashtown for all of you to make a good, comfortable living, besides enabling you to lay up a nest egg for a rainy day. Then why don't you do it? You say that prices are too low and costs of material and living are too high to do that. I know that your competitors are in a similar fix. So why not remedy these conditions? No one cares to work for unremunerative prices and I will simply tell you what I did when I once labored under similar conditions."

"Well and what did you do? I tell you, Johnny, I put my false pride in my pocket and took the first opportunity to call on my nearest brother smith and talked to him in a friendly, brotherly way, asking him if he didn't think that it was time that we came to some sensible arrangement with a view to improving the present conditions of things. I must confess that I was agreeably astonished to see how much he was in sentiment with what I proposed, only expressing the fear that some of the others might not fall in line. We then jointly agreed to interview the others, he canvassing some while I saw the others, and in one week's time we had prices somewhat where they ought to be, and later on adjusted other grievances. At the same time we stopped our faultfinding of each other's doings. We frequently met and exchanged ideas and we found life once more worth living. Now, John, try that plan and report to me again in a few months. I have little doubt that you will be fully reconciled to your business."

"Thanks, Thomas, I believe you're right. I will try your plan."

The Elementary Principles of Mechanical Drawing.—6.

The Finishing and Reading of Drawings.

When working drawings are to be preserved, inking in is necessary. The usual way, where it is desired to preserve the drawing and also to be able to make a number of copies of the same rapidly, is to trace the original pencil drawing in ink on tracing paper or linen tracing cloth. The latter of course is much stouter and stronger. From the tracing then, as many copies as desired may be made by the blue printing process, and these blue prints (in which the drawing appears with white lines on a blue ground), are used by the mechanic to work from. When it comes to inking in the drawing, it will be found best to put in all the curves first, beginning with the smallest, because it is easier to join straight lines to curved ones already drawn, than to make our curved lines conform to the position of straight inked lines. Care should be taken to keep lines of the same kind all of the same thickness.

For center lines a thin dot-and-dash line, as A B or C D, is employed. To represent lines not visible on the surface of the object, a dotted or broken line is used as at E or F. In this way, inner parts may be represented, and the amount of information given by the drawing increased. When this method of dotting in the interior parts is carried too far, complication is apt to arise, and to avoid this a sectional view is employed. The right hand half of the accompanying drawing is "in section," that is, the view is made as if the object were cut in half, thus laying open the interior. The surfaces supposed to be cut

are represented by "hatching" them, as shown, and such a view is called a "section." The surface is traversed by thin parallel lines, usually obtained by placing the 45-degree triangle in contact with the T-square, and drawing in lines at the required distance apart. When the surface is small these lines should be close, when large, farther apart. When the surface is very large these lines may be made to end at a little distance from the boundary. But this is only done in the case of very large surfaces, to diminish the work. When two different parts come together, in a section, it is shown by hatching them at different angles, as shown at G. If three meet, the 60-degree triangle may be used, in addition to the 45-degree triangle, to obtain different slants. Another way is to vary the distance apart of the hatchings of the different pieces.

Very often a drawing is made clearer by showing one piece in section and another in elevation. For instance the piston H and its spindle are shown in elevation instead of imagining it cut through also, thus bringing out more clearly the fact that it is a different piece from the shell which is sectioned.

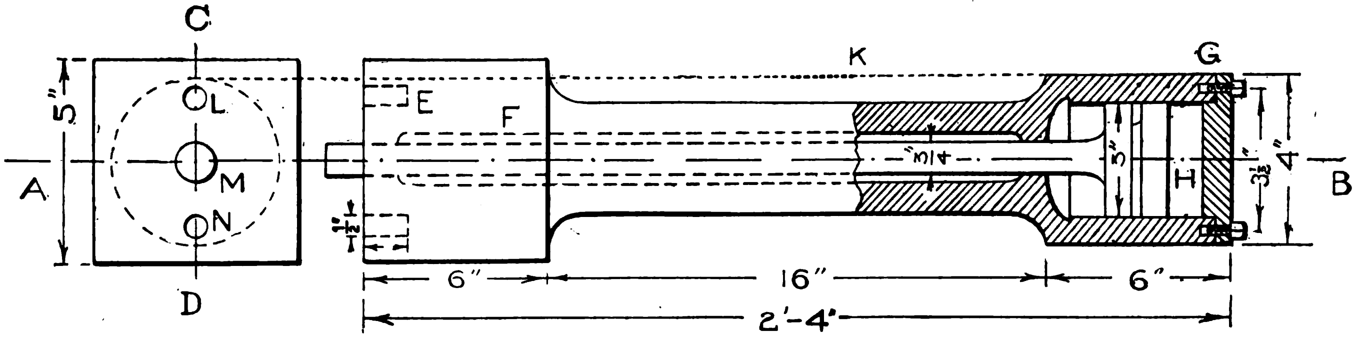
Generally speaking then, the lines of the object itself are put in with solid lines, and dotted or broken lines are used for invisible lines, center lines, construction lines and the like. Dotted lines are sometimes used to indicate the connection between the same part on two adjacent views, as the line K.

If a drawing were made simply in lines of the same thickness throughout, the sketch would present a flat appearance, and it would be impossible to distinguish a depression or hole from raised or projecting parts without referring to another view of the object. To render a drawing more easily understood a system of shading has been established. It is supposed, for convenience, that the light falls upon the object from the upper left hand side, thus throwing shadows from the lower and right hand edges of all except depressed surfaces or holes, these casting shadows from the upper and left hand edges. These shadows are indicated by thickening the lines upon these sides to about twice the thickness of the original lines. The figure illustrates these principles. Referring to the left end view, the shading shows L and N to be holes and M to be a raised surface. Examine carefully the shading on the figure. This shading is best done by drawing all the light lines first with the pen regulated to the required width and then the heavy lines with the pen altered to double the width. In shading a circle, two methods are in common practice. First, draw the circle with the bow-pen regulated to the fine-line width, then moving the needle a trifle to the right and below the original center (for shading the lower right-hand side) begin where the new circumference cuts the old, and trace the new circle from that point downward and over to where the two again cut. The other method is to draw the circle lightly first, and then with a broader line, go over half of it again, grading the extremities of the shade line by springing the bow-pen. The width of shade lines must always be placed *outside* the boundary lines of the object so as not to alter the proportions.

When drawings are made rapidly and in quantities it is not usual to draw them accurately to scale, but instead, each view is completely dimensioned so that the length of any important line or distance may be read directly from the drawing. Dimension lines may either be put in with lines of long dashes or more quickly by very thin solid lines. Dotted lines show from what points the dimension is measured. It is always well to give the various sub-dimensions fully and then an over-all dimension. Err on the side of too many rather than too few dimensions. Up to 24 inches, give dimensions in inches, above that in feet and inches. Thus 30 inches would be given—2′-6″, while 36 inches would correctly appear as 3′-0″ on a drawing.

In some cases it is customary to letter the drawing, that is, put letters in place of figures, and then in the corner make a list of dimensions, as A, 24″, B, 6½″, etc. This is especially useful in the case where the drawing is to answer for different sizes of the same object, a table of dimensions then being given. Take care to make all letters and figures perfectly clear and readable. They should always be so placed as to read from the bottom or right hand side,—that is, the figures should always be right side up when viewed either from the bottom or right hand end.

Finally every drawing should have a title and should also show the date and name of the draftsman. There are other marks and conventionalities used for indicating various things on a drawing, as for instance, "finish marks," and some of these will be dealt with in considerable detail in a succeeding chapter.



END ELEVATION, AND SIDE ELEVATION, PARTLY IN SECTION, OF A CYLINDER—ILLUSTRATING THE USE OF DIFFERENT KINDS OF LINES.

The reading of drawings intelligently implies a thorough knowledge of the principles which have been given before. In other words a clear understanding of how to make a working drawing, brings with it the power to read drawings understandingly, and to conceive, by a connected inspection of the different views, what the object looks like.

(To be continued.)

Best Method of Making Car and Locomotive Springs, and the Best Bath for Hardening.*

JNO. W. SMITH, CHAIRMAN.

On the road I am connected with, we make all our engine springs, and do the repairing for several small branch roads connecting with ours.

The making of a spring in my opinion requires the very highest type of mechanical skill, and close application to the small niceties that, by some spring makers, are considered non-essential.

In the selection of steel you want a mild, tough steel, and not a high carbon steel. I think it bad practice to use old

*Read before the Buffalo N. R. M. B. A. Convention.

steel unless you are reasonably sure that the steel is of the same make as the rest of your spring; if you are using a low per cent carbon steel for your main plates, and get a high carbon steel in your short plates, the life of your spring will be of short duration.

We prefer wide springs whenever we can use them and use not less than 4-inch by ⅜-inch steel in our truck springs, and in our driving springs we use steel from 4 to 5 inches wide; our experience, from close observation, being that a long and wide spring has greater elasticity, and consequently longer life and better service than a short, narrow spring.

I am an advocate of uniformity in spring work, the same as everything else in connection with our engine work; we have sheet iron templates for every class of spring, and have plates that we use for setting the main plates of our springs to, and we can thus take a spring plate that has been in service for years and place it alongside of its original partner, and in a moment by clamping with a light pair of tongs, get an accurate account of its performance; in the same manner, without any measurements, we can make a main plate or a second plate by using our sheet iron template, which is made of Russia or galvanized iron, with the slot cut out in each end 4 by 1⅛ inches, the same as the spring plate, and if we make fifty of them there will not be an eighth of an inch difference in the length of any of them.

There is one thing I desire right here to call your attention to in this connection, if you will pardon the digression. Why do you continue to tip the main plates of your driving and truck springs? Don't they break there? Don't you know to nib or tip your plates in the center necessarily weakens them at the very point where you desire strength and uniformity? In over twenty-five years' practical experience as a spring maker, I have never nibbed, or put any tip or device of any kind in the center of the first five main plates of my driving springs, or anywhere else, and I don't have any trouble with them either, and I will not have to make a dozen main plates for repairs in a year, and we have springs that have given us good service for six or seven years. I advocate and practice exclusively the end cross bar; for instance, take a driving spring; we use three full length plates, the third plate drawn, and the other plates graduated to the short 9-inch plate, which we never temper. Commencing at the fifth plate about 1⅜ inches from the ends we place a cross bar or nib ¾ inch wide, and allow the end of the next plate to barely touch it, or butt against it, and so on until we get to the 9-inch plate, which is perfectly plain with the ends drawn; this can be center tipped if you wish to hold your band, but it is not necessary, as the band should be put on hot and closed and shrunk on its place.

In our engine truck springs we use a round end, and by making the ends of our center plate overhang 1 inch and after the plates are all set and tempered and ready for banding, we heat in the forge clamps with a pair of tongs and bend this over-hanging end down over the round ends of our main plates; we next take our third plate and do the same way over the second, nibbing with end cross bar the third plate, and so on until the 9-inch plate is again reached.

In our double elliptic spring for engine tenders all eyes or inside spirals are made without drawing down, using the full size of the steel, the cuff leaf or outside spiral is drawn and made to fit closely. You will be surprised to see what excellent results are obtained by following the above form, and as soon as you become accustomed to it you will never want to change.

Perhaps some of you prefer to nib the ends of your spring leaves; you can use the same principle by simply breaking the continuation of the nib back from the point. Say you make your nibbing tool 1 inch long, then a blank for ¼ of an inch, then a small tip on exactly the same principle as the slot and tip in the end of spring leaves, that were in use some years since, and I suppose some roads are using them yet under small capacity cars.

I should like in this connection to state that all of the slots in the driving springs for the spring hangers to pass through, on our road, are of the uniform size, 4 by 1⅛ inches, and it not only saves spring hangers, but gives the spring a chance to vibrate.

In advancing these ideas, gentlemen, I wish to state that nearly all over the State of Georgia there is not a road that tips the center of main plates, and it is no experiment, but practical experience has proven the wisdom of our action, and it has saved our roads thousands of dollars in labor and material, and we hold up a record for twelve years. We have not had a freight or passenger train delayed by a broken spring on our division of nearly 400 miles.

All main plates for springs in our shops have the palms welded on in a simple tool under the steam hammer (we use a flux, common fire clay); we have a punch we use under the hammer that punches out the slot 4 by 1⅛ inches in one blow, in our driving springs (in the same heat that we weld the thickening palm on.) We weld a thick palm on the main plates of our truck springs, in a tool which gives it the correct shape under the hammer, in the same manner. The ends of all spring plate that are drawn to taper are drawn under the hammer with a tapering tool made for the purpose; the cross bar nib is placed in a small tool that fits the square hole in the anvil.

We have a hand roller for setting the hot plate to the cold one, but our spring maker claims he can work faster by using the clamp tongs, especially made for the purpose, with the ring made fast in an eye at the end of the handle. These clamps are made of cast steel, and extend the full width across the spring leaves, and are about ¾ inch square; we use seven pairs of clamps or tongs on our long leaves, one pair in center, one pair on each end, and the rest intermediate. A good spring maker can easily set and temper from 10 to 12 driving springs in a day of 10 hours.

Our furnace is 12 feet long, 5 feet wide and 6 feet high, and burns either wood or soft coal; it has a bridge wall 4 feet 6 inches from the fire door end, extending within 5 inches of the top of the furnace, so as to throw the blaze to the front, and will give a perfectly uniform heat. The floor of the furnace is made of fire brick, as is all the inside lining in this furnace, which can be utilized for any purpose, almost; we have seven feet of working space, and do, besides spring work, all our case hardening, and heat arch bars, brake beams, and all our heating for bending on our bulldozer, which is situated conveniently near.

In setting up springs the spring maker selects the two springs he wishes to set at the same time and places them in the front of furnace, parallel with it; he takes the first two main plates of each spring and places them inside of the furnace, No. 1 on the right hand side and No. 2 on the left hand side, as the helper, with a pair of right angle tongs made for the purpose, places the main plate of No. 1 on the spring table to be set to proper shape; he places the next leaf in the furnace, and so on until both springs are set up to standard. The spring-maker now places entire No. 1 spring in the furnace, separating the leaves so as to better enable them to heat evenly, and by slow firing brings them up to a good red heat, which generally takes 20 or 25 minutes, when it is removed from the furnace, and as fast as removed the

helper carefully places it in the vat of raw linseed oil.

The gather or camber between the plates of a spring should be carefully given, commencing with about ¼ of an inch between the main plates and gradually diminishing up within four plates, including the short one; these four short plates, being mere supports for the main plates, should not be given any camber, as they are practically non-elastic.

While the tempering of a spring is a very important operation, and one that should be done very carefully and not hurriedly, it is not the only requisite for good service, as the leaves should lie closely and evenly to each other, otherwise, if they bear only in spots, it will be useless to put such a spring in service when banded; these should be so close that you cannot insert the point of a pin anywhere between your leaves. The proper heat to place the leaves of the spring in the tempering bath can be determined very quickly and correctly by placing a long plate in the furnace and bring it up to a good red heat, which I will define as the heat just previous to the forming of scales. A spring plate should never be allowed to scale, as it undoubtedly pitts it in spots; while it may not be discernible to the naked eye they are there, and have a tendency to shorten the life of your spring. After you have raised the temperature of your spring plate to the above heat, remove and temper in hardening bath; when perfectly cold remove, and place a piece of iron about 6 inches wide, ¾ of an inch thick and 4 feet long under your steam hammer, place your plate thereon, measure the height from the iron to the top of your spring plate, descend the hammer, straighten out your spring plate, raise the hammer and measure your plate. The deflection should not be over ⅛ of an inch; now let the hammer descend again as before, and repeat the measurements; the leaf, if at the proper temper, will not go down after the first depression. If you find your leaf is too soft, replace in the furnace, and go through the same operation until you determine the exact heat at which to place your spring in the hardening bath.

In spring work, as well as in everything else connected with the locomotive, don't have any guess work, in the broad field of mechanical genius, which is luring into her fold the brightest minds to-day in our lands, with our technological schools and our institutes of learning and correspondence schools and railway journals doing so much for the railway service, and particularly our branch of it, and in view of the rapid advance that has been made in the art of blacksmithing since the formation of the Master Blacksmiths' Association. We are now entering upon a new era, and we hail the coming of the steel king and realize that, if we are to be his honored guests or servants, we must be advanced on practical ideas as well as faithful in good work. The hardening bath stands first and above all of perfectly pure raw linseed oil. I have used fish oil, and cottonseed oil, and various compounds, but for a first-class tempering bath the pure, unadulterated, raw linseed oil leads them all. Our hardening bath consists of two sheet iron tanks 15 inches wide, 4 feet long and 2 feet high, placed in a wooden trough 10 feet long, so as to allow a good circulation of water all around; we have an inlet water pipe at one end of the water trough, on the bottom, and the outlet at the top of the water trough in the other end; we keep our oil tanks full to within three inches of the top, replenishing as it is used out.

The bending of your spring is next in order; when after removing all dirt and oil with a piece of waste, place your spring upon spring table, where you can either clamp your spring with a screw clamp, or a very simple arrangement for banding springs can be made by taking two "I" beams, clamp upon one end, 12 inch cylinder, and then bolt a 4-foot face plate thereon, which will not interfere with your doing other work on it, as you can have an angle plate that can be easily removed; make a frame of light iron 36 inches long, in the form of a figure H, with the ends cross barred, upon which you can lay your spring plates; let your piston from air cylinder press your leaves together when you can place your screw clamp in position so as to hold your spring while you slip your band in place, when you again turn the air on your cylinder, causing the piston to press your band firmly to place. Then you can close the sides down with a set hammer and light sledge, and cool off the band with hose, on the machine; a good spring maker can easily band three springs an hour with this arrangement.

I have tried in as simple a manner as possible to give you an outline of the manner in which springs are handled in the shop under my charge. I consider it the very best practice in use to-day, and it is used in the different shops of our company; if I thought there was a better way I would abandon mine and adopt the other, as I want the best, which is always found to be the cheapest.

Now, I want to say something that I want you all, as practical railroad men, and having the very best interests of your companies at heart, to ponder over; take it home with you. I think it a serious mistake for railroads to have to give their spring work to some other concern to do; I should think it a reflection on my ability if I could not handle the springs for my company, so as to give them satisfaction and save them money; one thing is certain, no one is going to give us anything, nor are they going to let their product go out without a good safe profit, as manufacturers have to make from 25 to 40 per cent. profit to do business. I should like to have my company, and I think it would pay all our large systems, to select some point and establish an up-to-date spring plant, where all car and locomotive springs could be made, both elliptical and spiral, and in this age, when you can purchase combined punch and shear, eccentric rolls for tapering, both round and flat steel, power rolls for coiling springs, with a capacity of 600 drawn bar springs per day, furnaces with thermometer attachments, showing what temperature of heat your furnace contains, and every facility to expedite your work, testing machines that will show the slightest defect in the finished product; in other words, gentlemen, let us reach out, expand, and see how we can increase the value of our services, and accomplish greater results. Finally, before closing this report I want to impress upon you, in the selection of a spring maker, get a first-class man; don't let pay stand in the way; you don't want a cheap man. make him feel the responsibility of his position and give him to understand that efficiency of service alone will make him secure in his position. In my shop the spring maker is the highest paid man, and I guess he receives as good pay as any man in the country—$3.60 per day and I consider it a good investment; he feels that he has something to hold on to, and as soon as he fails to give satisfaction, why he must stand aside and make room for one more competent.

A good spring maker who has the interests of his company at heart is a gem beyond price in the railroad shop, and should be valued as such. By any wise firm he will be paid accordingly. This branch of railroad blacksmithing needs particular skill, and even the most competent men should be always ready to learn and to improve in the art. By exchanging ideas this good end may be furthered.

The Evolution of the Tire.

By Courtesy of The West Tire Setter Co.

In these wonderful days of accelerating progression in the arts, it is surprising, when we note how soon the old way of doing things is forgotten after the new is adopted, and how few of those interested in tiring wheels for the millions know that it was not always done in the way they are doing it, with a tire in one piece, and that that way was new and a great invention in its time.

In the writer's boyhood there was an old cast-off cart wheel lying in his father's shed that was tired in the good old-fashioned way, the best that was known at the time it was made, the tire being in pieces, same length as the (sawed) felloes, and nailed on, with the ends of the tires in the middle of the felloes, "breaking joints," and the nail holes being punched in oblong form, similar to those in horse shoes, only much larger, the longest way across the tire, three at each end, and others along the center the entire length, the nails being forged to fit, with a cutting edge across the grain of the felloe. It was common for the teamster to be furnished with nails on starting out on a trip, to replace those that might be lost on the road, thus becoming his own tire setter. But an improvement was made, claimed by many, but who the real inventor was is uncertain.

A smart smith thought of a hoop for a tire,
  Welded it up when the boss was gone,
Heated it well in a circular fire,
  Doused it with water and shrunk it on.
Many a smith would not believe it,
  Many a head was shaken "no,"
Many a one would not receive it,
  Nevertheless it was a "go."
It was a great thing, 'twas a wonderful day,
  When tires were shrunk on in this new-
    fangled way.

HEATS SPARKS WELDS

How is the fall trade, and what are the prospects for sleigh work this winter?

A fine day in the rainy season is like a customer who pays without being dunned.

Try to persuade your neighbor to read a trade journal. He needs it—convince him that he does.

One fire under the management of an able smith will accomplish as much as two less carefully managed.

A little glycerine in the water in which paint brushes are kept will prevent its freezing and will not injure the brushes. Ever tried it?

When a man goes on advertising it is safe to suppose that his wares are reliable, for nobody will keep on laying out money in this way if it is not bringing him trade.

Now is the time to prepare in earnest for winter's work. Have shop and tools ready for sharpening, sleigh repairing, and the profitable odds and ends of work

A good fire is the blacksmith's best friend. Any smith should make a study of his forge, his blower and his coal and how to manipulate them to obtain the best results at the least expense.

How many horses have you shod during October? How many odd jobs done? Add a little to the proceeds from each, and think how much more you might have if only you had raised your prices.

Manufacturers and dealers who sell to shop-owning blacksmiths or wagon builders highly favor a better scale of prices, because they know it means better buyers and better conditions all around.

Try something new. In your stationery —in your advertising—in your methods— in every department in fact, strike out in an original way, and do not imitate. Something new attracts people every time.

Find time to read and think! Make time. The busiest man is always able to crowd in a little more, where the easy-going, shiftless man who wastes hours every day will say he has no time for reading or such things.

People need managing. Treat patrons in such a way as to bring out all their best and most agreeable qualities and leave the other uncomfortable traits sleeping within. Any business man with the proper amount of tact can do this. Cultivate tact.

A rubber stamp with your name and address on it finds innumerable uses in your correspondence, billing and the office end of your daily work. It insures a neat, legible signature and address even when you are in a great hurry and somebody is waiting.

The farrier has much to do with the winnings and losses of the race track. At Memphis, Lexington and other places this fact has been proved recently, when renowned racers have failed to win just because their feet become sore and lame from improper shoeing.

A special file for catalogues received from leading firms, is almost indispensable in the blacksmith's office. It is so convenient to be able to put your hand on the information you want when you want it. Many smiths are too careless or too lazy to even save their catalogues.

One reason why America has such a high class of mechanics is that the workmen of America consist of the most enterprising men from all over the world working in a prosperous country with favorable conditions of food, clothing and the like. No workmen are better off.

Tom, Dick or Harry does so, but that is nothing to you. The man who tries to build a reputation upon other men's faults has a poor foundation. Never run down a fellow-craftsman, but go ahead and build up a name upon your own fair dealings and excellent work. This is the straight way.

The care of horses is carried to the extreme in Norway and Sweden. In these countries the farmer and his wife and children will walk miles to church on Sunday, just to give their horses a rest, and many of them will not hire out their horses for money. These working horses are the best cared for in the world, and as a consequence are very strong and high spirited.

Two distinct horse species exist at the present day in common use. Scientific research leads to the theory that the heavy draft horse, with his thick feet and flat nose is derived from the ancient Celtic stock, while the light harness horse, the race horse and such are from ancient Egyptian.

Progressiveness is shown by many smiths in purchasing typewriters. Every few days letters from blacksmiths come in, written on typewriters. The best machines cost in the neighborhood of a hundred dollars, but good serviceable typewriters can be bought for much less, and their purchase displays both progress and progressiveness on the part of the smith.

"Afraid of the cars" is a term which applies to many blacksmiths. So write some of the many men who are striving to have the prices of blacksmith work increased in their counties. Every one of these timid craftsmen is free to admit that he is doing work too cheap, sometimes below what it actually costs him, especially when he takes into account his bad debts, and yet they are afraid to raise their prices for fear some other blacksmith won't raise his prices and will get a little more trade. They do not stop to consider that some business men in large institutions feel that it is a great privilege to let contracts and orders go to the other fellow when the work has to be done at a loss, when there is no money in it, or when the account is doubtful. These blacksmiths forget too, that even the dealers and manufacturers of the material they use are with them for better prices. These dealers and manufacturers are charging more money for their stuff and yet many blacksmiths have not the nerve to ask more money for their work. There has been an awakening in many a county and town through the good work of the American Association of Blacksmiths and Horseshoers. It is steadily growing day by day. Are you with it?

Tom Tardy was thinking hard as usual. He was at last trying to make up his mind to begin to think about getting an engine The necessity had pressed itself upon him since passing a neighboring smith's shop and noticing a crowd of people all eagerly watching an engine. The smith was "making it saw wood and do a number of other stunts," as Tom explained. So at the end of the month Tom began to consider that if he had one, he too could make extra money. "But," said he with a troubled expression, "I don't know whar to get hold o' one."

"Why don't you consult some manufacturers' catalogues?" we asked him. "Well," he replied, "I used to have some o' them thar little books, but I never kep' 'em, an' the trouble is I don't know whar' I could write for more. I don't seem to mind the name o' the feller what makes 'em."

We told him that there were a great many good engines made and suggested his getting a current trade journal of good standing to obtain names and addresses.

"Well now, I'll have to think about that, too," he mused, and proceeded to think accordingly.

Perhaps Tom will install a gas engine in the year 1920 or thereabouts—there's no telling what seeming impossibility may come to pass in this rapid age.

American Association of Blacksmiths and Horseshoers.

One of the aims of the above named Association is to secure lien laws in as many States as possible to aid blacksmiths in collecting their bills. Low prices and unwise competitors have narrowed down the margin of profit so small, that few smiths can make a just living if any of their work is done without pay. The blacksmith, the horseshoer or the wheelwright must buy his stock at prices fixed by the dealer, and must pay for it within a certain time or no more stock will be forthcoming. How then is he to carry on his business if his own customers pay when they please, or not at all? Some craftsmen are fortunate enough to have such a superabundance of trade that they can turn away poor-pay customers, or demand spot cash. Hosts of mechanics find it necessary to take all the trade that offers, spend their good money for material and their good time in labor, and then take chances as to pay.

Certainly the laborer is worthy of his hire, and none more so than the smith, contending as he does with heavy, grimy work, and extremes of heat and cold. Other crafts have their laws to enable them to collect their bills, and prevent losses from bad debts. They secured such protective legislation by agitating the need of it, by asking their legislators for it, by working together for it. Are not blacksmiths and wagon builders entitled to similar lien laws? They can be reasonably certain of securing them, but it will require their active support. If our blacksmith craftsmen sit with folded hands waiting for lien laws to be inscribed on their statute books, they will be apt to wait for a long time. Other trades have secured favorable legislation by actively working for it, and so can our crafts.

The American Association has perfected plans for getting these State lien law movements under way and is sending out a great amount of literature and printed matter to awaken interest in them. The point it is desired to make here is that each individual shop-running smith whose eye this meets, should aid in the good work. The American Association will lend its labors to secure the drafting and introduction of the necessary bills in various State legislatures, and will also lend its influence towards their passage.

The influence of the craft itself must be enrolled. The plans for doing this have been perfected, and you are earnestly requested to give your hearty support to the movement in your State. Write to The American Association of Blacksmiths and Horseshoers, Box 974, Buffalo, N. Y., for further information. The support asked of you amounts simply to writing a few letters. Will you give this support?

Steel and How to Treat It.—6.

JOSEPH V. WOODWORTH.

Water Annealing—Other Methods.

There are several methods of water annealing, and in the following I describe the best; the worker may adopt any of them, according to the results he secures from each. The first method consists of heating the steel slowly to a dull cherry red, and then removing it from the fire and trying the heat with a soft stick. When the steel has cooled so that the wood ceases to char, plunge the steel quickly into an oil and water bath. When the steel is worked it will be found to be as soft as could be desired. Another method consists of heating the steel slowly to a red heat, and then allowing it to lie in the ashes for a few minutes until it becomes almost black. Then drop it into soapsuds and allow to cool there.

When a piece of steel has been water annealed it will prove much easier to work than if annealed in the regular way by packing in powdered charcoal or in old bone and allowing to cool over night. A good way to make sure of the time to quench the steel in the bath is to allow it to cool until almost black, and then touch it with a file. If the steel does not brighten for an instant and then turn blue repeat the experiment, and if upon this second trial the blue appears and then a bright spark afterward, drop the steel into the bath instantly.

Not infrequently a piece of steel which is to be used for a fine cutting tool, say for instance a cutting die blank or a forging, proves hard and brittle, although it has been annealed. When this is the case, do not attempt to finish it, but simply rough it down and anneal it over again.

Of course, it may appear strange to some, but it is a well substantiated fact, that results possible to attain in steel by means of the water anneal can not be had through any other known method. Water annealing seems to give a certain texture to the grain of steel, which, while not exactly softness, is quite different from that obtained through the pack processes of annealing. A piece of steel that has been properly water annealed upon being turned in the lathe, using soap-water as a lubricant, will present a strange dead-white appearance, and the turnings will be short and come off in little bristles. On the contrary, steel that has been annealed in the usual manner will turn off in long, close curled lengths, and the surface of the work will present a more or less torn texture, even when a very sharp tool is used. This tearing comes about through the steel being too soft, so that it gives way and crowds up into little lumps just slightly ahead of the cutting edge of the tool.

This unpleasant feature is overcome, however, when the steel is water annealed, as this process seems to give the requisite stiffness of texture to the steel to prevent tearing. Considering the results, the water anneal will contribute to the best results being attained in a large variety of work.

I am unable to state just what chemical or molecular action takes place in steel that is water annealed. I know that it is not a softening action, as compared with the effects of ordinary annealing, but instead an action that stiffens and tightens the particles, which allows the cutting edge of the tool to creep beneath the shell and peal it off.

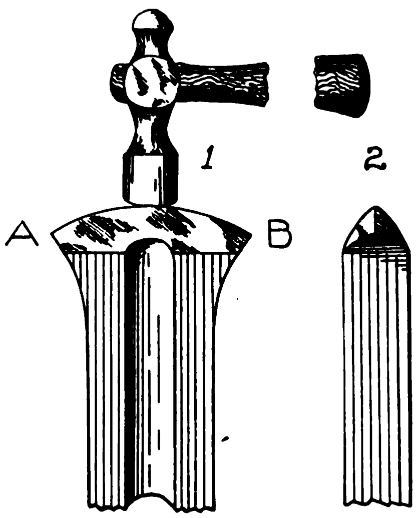
For emergency jobs, where the steel has to be annealed quickly and thoroughly, use any of the following methods: (1). Cover with tallow, heat the steel to a cherry red in a charcoal fire and allow it to cool by itself: (2). Heat the steel to a cherry red and allow to cool in a dark place until black appears, and then quench in the juice or water of common beans. (3). Cover with clay, heat to a cherry red in a charcoal fire and allow to cool slowly.

To anneal steel in the open blacksmith's fire so as not to injure its grain and to prevent hard streaks, make a clean fire with a good body of coke. Bank the fire well on the sides with green blacksmith's coal and then place the steel on the fire and cover it with live coals. By using a gentle blast and turning the steel frequently from side to side, even heating will be assured. When the red color appears shut off the blast for a few seconds to allow the heat to reach the center of the piece. Then the steel may be taken out of the fire and placed in an iron box and surrounded with clean, thoroughly pulverized lime, to be left there until cold.

The reason why lime and ashes when not cold make good packing material for annealing tool steel is because they contain no carbon. A quality that makes the lime valuable is the dense way in which it may be packed, holding the heat in the steel longer than any other

substance used for the same purpose.

In annealing steel in the manner described above, when care is taken to heat evenly, no hard streaks will occur. Use



Figs. 1, 2. AN EXCELLENT MODE OF SHAPING A DRILL BIT.

steel in which the carbon is evenly distributed, and heat thoroughly and evenly.

A very good and satisfactory way of annealing at the forge consists in taking a piece of pipe and plugging one end. Then place it in the fire and cover over with damp coke. Have the open end of the pipe toward you and when red hot check the blast and insert the article to be annealed. By turning the pipe at intervals the heat will be equalized. As soon as the steel reaches a blood heat remove it and bury it in sawdust, which must be dry and *not damp*. Remove steel when cold, and not before.

Self-hardening steel is now being used generally for cutting tools of all kinds, and as this steel has often to be worked into difficult shapes it is well to understand how to anneal it without affecting its self-hardening qualities. The method applies to any of the well-known brands of self-hardening steel.

Pack the steel in cast iron chips in a cast iron box, and heat up in a furnace to a bright red heat. Leave box in the furnace over night and the result will be that you will be able to work the steel as readily as a piece of machine steel. This annealing process *will not destroy the self-hardening qualities*, and the steel may be re-hardened by heating to a bright red and cooling in an air blast, when it will be found to be as hard as it was before the annealing process had been applied.

Always remember that the principal thing in annealing is not to overheat the steel. When steel *is* overheated it is permanently ruined, and cannot be restored to its former condition. Another thing, do not hold the steel at the annealing heat any longer than is necessary. Although it is required to heat the steel that is to be annealed to a very high temperature, and to hold it there until all portions of it are thoroughly heated, it is not well to keep it there too long, or decarbonization will occur; so that when it is hardened and tempered it will not be found satisfactory. This will show principally in the tempering, as a piece of steel that has been kept hot too long will not show true to the temper colors; in fact it may be only drawn to a light straw temper and then may be readily filed.

In conclusion let it be understood that the principal requisites to successful annealing are uniform heating and thorough heating; the use of packing materials which will not decarbonize the steel; non-exposure to air during cooling and in water anneal, care and practice.

To be sure, the method employed when annealing steel will depend on the facilities which the shop affords; and it rests with the individual whether he shall succeed or not, as the methods described here are in number and variety sufficient to allow of annealing successfully in any shop, however meager the facilities may be.

(To be continued.)

Dressing Drill Steel.

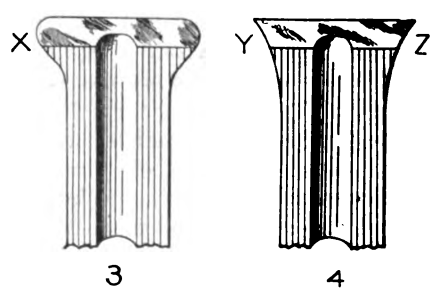
BY L. R. S.

Having noticed in THE AMERICAN BLACKSMITH, frequent inquiries regarding the dressing of steel for rock drills and well drilling bits, and tempering the same, I will endeavor to give the readers of your paper the benefit of my experience of twenty years' practice in that department of the smith's craft.

In regard to materials, do not attempt that class of work without the best coal to be had, and plenty of it; next comes the fire, which needs to be deep and kept as clean as possible. In connection with this, it is necessary that you should have a good, even and steady blast. Above all else, after having placed your steel well into the fire, avoid rushing your heat—give the heat a chance to thoroughly penetrate the steel and to run back three or four inches from the point at least.

Forge the steel at as low a heat as it will work under, which is at or about a bright red—bear in mind that the better the steel the less heat it will stand. Having raised your heat, you are ready to forge the bit which consists of two operations: 1. Forming the cutting edge. 2. Bringing the bit into gauge. In forming the edge, begin in the centre of your bit and drive the steel well back, and then work toward the corner A. Having reached the corner, begin again in the centre and work to the corner B, turn the bit over and repeat this operation on the other side, being careful to keep the edge well centered so as to evenly divide the strain throughout the bar above the edge. Right here comes in a very important part of the job, and that is to make the angle at the cutting edge greater than a right angle; say 95 or 100°, which is a little blunter than the corner of a square. This last is necessary for two reasons. First, to enable the tool to drill a round, straight hole; second, to furnish a sufficient body of steel back of the edge to stand the strain of driving the high tempered edge into the rock. I might also state another reason, which is this; in every piece of steel which is tempered on the end (as a drill) there is a zone of annealed steel just above the tempered part which is softer than any other part of the bar. Right there is where the steel will crush and finally break, under a succession of heavy blows, and this is the point where the greatest body of metal is required.

After having shaped the edge so that it centres well with the bar or shank of the bit, and is also square across, like the edge of a chisel, the next step is to renew the heat and bring the corners in to gauge. You will probably notice that the wings of the bit above the edge are bulged, or as drillers term it, bull-nosed, and the bit larger than the gauge.



Figs. 3, 4. PROCESS OF FORGING SHANK OF BIT TO PREVENT COLD SHUT.

The proper way to bring the corners in to gauge is to begin forging at the shank of the bit and work toward the point of the corner formed by the cutting edge. This is the only way to prevent a cold shut forming where the wing flares out from the shank of the bit at Y and Z, Fig. 4. This shut is the cause of corners breaking off the bit in the hole.

In gauging bits some gauge with

calipers, others use gauge rings. The ring gauge is the best—it should be $\frac{1}{16}$ inch larger than size of bit when cool.

The proper way to gauge a bit is to make not only the corners of the cutting edge, but also the corners where the bevel of the edge leaves the flat side of the shank conform to the circle of the gauge which is the circle of the hole the

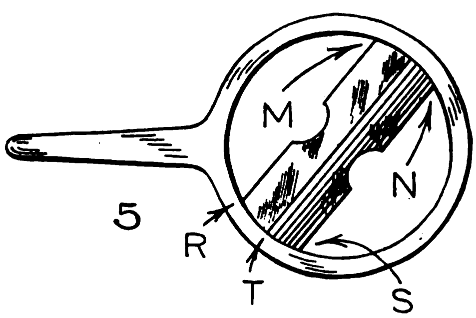


Fig. 5. GAUGING A BIT WITH CALIPERS.

bit is to cut. See Fig. 5. If calipers are used, the measure of cutting edge S should also be the measure from M to S, and from N to R. This prevents the bit from bulging over and going crooked and also keeps the hole round. The thickness should be a little over one-third the diameter of the hole to be drilled.

All bits of 1½-inch and upwards, should be fluted as indicated in cuts, to bring a more even temper and to give a better clearance in the hole. Bits of this pattern, in most rock, work faster and as well as the three and four-winged star bits on air or steam quarry drills, and are the best for hammer and hand use. They are also the most reliable for well drilling machines. All they need is a good temper and they will cut anything it is possible for steel to cut.

When nearly cool and before raising to the hardening heat, sprinkle a little powdered resin over the face and wings of the bit, or better still, make a groove in a piece of rich pine and press it against the edge and wings of the bit until the resin forms a coat over the steel. Then place the steel in the fire and raise to a good even heat on the cutting end for three or four inches back. This heat should be a dark cherry red for good steel; poorer steel requires a higher heat. Dip end into warm salt water until the water reaches ½ or ⅝ inch above the level. Agitate the water with a stick until the edge is chilled.

Remove the bit and with a file, piece of brick or sandstone, rub off the scale on the wings and edge. If the steel is properly hardened the rubbed places will present a silvery lustre, and as the heat in the shank runs out, it will draw the temper. When the color of the rubbed steel near the edge reaches a deep copper color the right temper is had and the bit should be quenched in cold water or in salt water, as is most convenient. The salt water clings to the steel better than pure water, and hardens better. My rule has always been to temper for the hardest rock. Almost any kind of drill will cut slate or smooth lime stone, but when rock harder than cast iron must be drilled one has no time to experiment. It often happens in dressing 5⅝ or 6-inch tools or over, the common smith fire is too light to make a good heat, and the corners get a little singed. In this case the resin or rich pine tends to toughen the steel and restore its carbon. Bits treated in this way wear longer than when no resin is used.

1⅛-inch or 1¼-inch octagon steel should not be driven with over a 6-pound hammer. Often the fault is in the hammer rather than in the smith or the temper—of course the smith gets the blame.

Drilling bits over five inches in diameter of gauge are more satisfactorily handled in a fire made in the ground and forged on a rack and billet than on the anvil. See Fig. 6. This method saves much lifting, and the bit is easier to manage in forging.

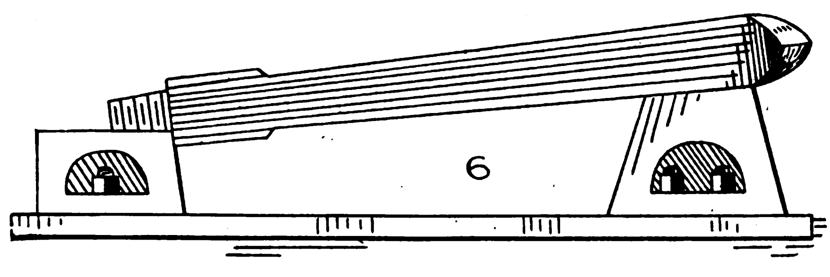


Fig. 6. A CONVENIENT WAY OF HANDLING A DRILLING BIT IN PROCESS OF FORGING.

Classification and Treatment of Tool Steel.

JOHN L. BACON.

The following method is used in a large manufacturing shop to give certainty of results in the treatment of the various grades of tool steel used in making a variety of tools:

When a lot of tool steel is received a sample piece is broken from the end of one bar and drawn down to about ½ inch square. Several small cold chisels are forged from this sample and one of them is hardened at a heat thought to be below the hardening heat of the steel. If too low, the chisel is again hardened, this time at a little higher heat and this is continued until a heat is found which hardens the steel properly and gives the proper grain (determined by snapping of the tip of the hardened chisel).

The hardening heat being fixed, the chisels are hardened and then experimented with for the proper "temper." This is done by drawing the temper of the hardened chisels to different degrees in heated oil, the temperature of the oil being indicated by a thermometer. The chisels are tested and tried in different ways until the temperature is determined which leaves the steel in the best condition.

The above is assuming that the lot of steel tested is to be used for cold chisels; if to be used for other tools the experimenting for temper would be done somewhat differently, the object being to determine the exact temperature giving the temper that will best enable the tools to meet their working conditions.

This experimenting being finished, the information gained is written on a ticket which is kept in the rack with that particular lot of steel.

When an order ticket comes into the shop the man who fills the stock order notes down on the back of the order ticket the information gained as above. The hardener notes the proper hardening heat as shown on the order ticket and does his hardening accordingly. The man doing the tempering places a quantity of tools in a wire basket, dips this into a vat of heated oil, waits until his thermometer shows the proper temperature, which he has learned from the order ticket, and then draws them out, finished.

The above method insures uniformity of results and a reasonable certainty that the steel is being properly treated.

Blacksmithing Hints from a Practical Standpoint.

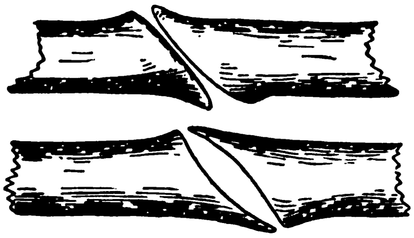
J. M. FIX.

The Art of Welding.

Good coal and good materials generally, are among the essentials. A good fire is indispensable, if you wish or

expect to attain to the highest degree in the art of welding.

Have your tuyere iron from 4 to 8 inches under. In other words have 4 to 8 inches of coal on your tuyere iron depending upon the character of the work



THE RIGHT AND WRONG METHODS OF MAKING A WELD.

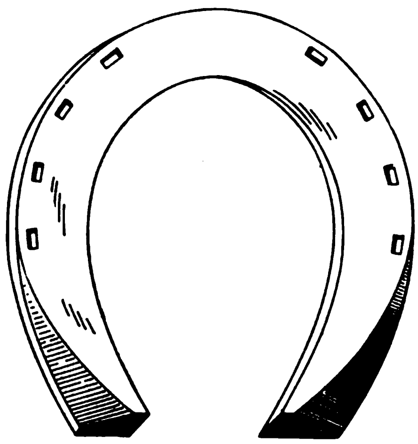
you are doing. Coke your coal and beat it down solidly around your fire. Now heat your iron to the welding point—upset and scarf. In order to make the most perfect welds, you must scarf your iron properly. Upset well to allow for wasting away. Have your scarf full in the center, so that the two pieces to be joined will touch in the center first. If there is a hollow in the center, foreign substances are liable to collect in there and cause a very imperfect weld. When they have reached a good, clean, white heat with the scarf down in your fire, take them out and give each one a good jar on the anvil while the scarf is still down, so as to jar off any dirt which may be on them. Reverse or turn over the one you have in your left hand, get them together as quickly as possible and hammer rapidly so as to get them united before the heat gets below the welding point. The cold anvil will reduce the heat below the welding point in a very short space of time. In case of failure to weld perfectly at first heat, in most cases a second one can and ought to be taken. However, in a majority of ordinary welds, one heat is sufficient to make it nearly enough perfect. Judgment must be used as to whether a perfect weld is required. No sign of the scarf ever shows on a perfect weld. But there are very few jobs that actually require an absolutely perfect weld. To make a weld with the least labor and the greatest assurances of a perfect job the scarfs must be short. If the scarfs are long the laps must be long and consequently too much time is required to reheat and too much labor to weld. Some of the most difficult welds you are compelled to make at one heat, and it is impossible to reheat. Then how essential it is to be able to do so when required.

To weld steel is a different proposition, there are so many kinds that the same rule will not apply to all of them. Cast tool steel is a most difficult kind to weld, likewise spring steel; various methods are used in accomplishing this. It is impossible to enter into details upon the various steels. Heat in a clean fire with borax or some welding compound and experience will tell you to weld at as low a heat as it is possible and stick perfectly. Most axles can be given a high heat and use nothing but sand on them. Some use sand on iron. In some cases it is very important. Don't be continually poking at your fire. Let the clinkers gather at the bottom.

Criticisms on a Method of Shoeing Contracted Feet.

C. W. METCALF.

In a recent issue a brother smith gives a method of shoeing contracted feet. He says he uses a Burden shoe and punches extra nail holes in the heel and then after the shoe is driven, with a pair of tongs spreads the shoe until the horse flinches.



AN ORIGINAL FORM OF SHOE FOR CONTRACTED FEET.

According to my experience, I would say that this method is wrong. When you spread the hoof ¼ of an inch it is held direct in one position by the extra nails and the hoof has no chance to moisten itself at all. If you want to spread a contracted hoof properly, take a shoe and make it fit the hoof, bevel the shoe from the first nail from the heel on the outside and leave the inside as high as you can. Then with a knife cut the heel each side of the frog so that when you place the shoe on it will fit the shoe, and drive the shoe solid. Every time the horse places his foot solid on the ground, it will spread itself and when you get the hoof to working it will open the pores of the hoof; it will then furnish its own oil, become soft and will stay to its proper shape. The shoe is made like the figure herewith, and every time the horse sets his foot down it is bound to spread, and when it is raised it will come back, which will break the horny scale of the hoof, after which the hoof will commence to moisten. You never saw a moist hoof contracted. At least this has been my experience for the past fifteen years.

A New Article of Food for Our Friend, the Horse.

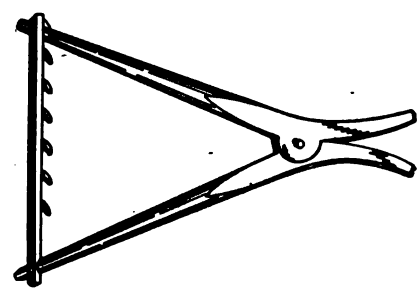
The breakfast cereal craze seems to have descended to the brute creation. A new article on the list of stock foods is a composition known as molascuit, says a contemporary. This substance was introduced by Mr. George Hughes in the West Indies.

For some time now, experiments have been made with molasses as food for animals, but of course it would be neither convenient nor practical to present it to them in the sticky, liquid state. The new invention overcomes this objection. The molasses is absorbed by the cellular matter of sugar cane that sifts out of the bagasse. The substance resulting may be packed in bags for transportation purposes. The chief value of the new food lies, of course, in the molasses, but the bagasse also has some nutritive qualities of its own.

A Few Words About Contracted Feet.

C. G. BURDICK.

The first thing to do with contracted feet is to place the foot in warm water for about three or four hours, after which pare the foot out well. Make a shoe one-half inch wider than the foot, convex the shoe on the top side, put the nail holes just as far back as the foot will stand. Then with a foot spreader open up the foot; nail the two toe nails, draw them up, and with the spreader open the foot as much as it will stand, from ⅜ to ½ of an inch, keeping the foot well oiled with neat's-foot oil for a few days and your



A NEW KIND OF SPREADER FOR USE IN HOOF CONTRACTION.

horse is cured. This at least has been my experience for twenty years.

With regard to the spreader which I use, the sketch herewith shows the same. Opening the handles closes the tips and vice versa. They are fine and the boy should try them.

The treatment for contraction must be persistent, and the cause, as far as

possible, removed. The spreader I have described is a simple device that any smith can make.

Origin and Nature of Sand Cracks.

BY S. H. M.

When a horse is first noticed to have a sand crack in his hoof, every precaution should be adopted to prevent its growing larger, and every means employed to favor its healing. The horse should not be driven fast nor allowed to jump. There are two kinds of sand cracks—toe cracks and quarter cracks. The toe crack runs from the toe generally to the coronet. A quarter crack is on the inside quarter of the hoof, which being thinner and receiving more weight of motion than the outside, is therefore more liable to the disease. Although cracks usually extend upward in the grain of the hoof, they are occasionally found to run transversely for an inch or so.

There are several causes which conduce to sand cracks. Some hoofs are poorly nourished, and consequently brittle by nature, others are brittle from travel on wet roads, which wash the natural elasticity out, leaving them brittle, and both these causes may lead to sand cracks. It is also generally conceded that the use of shoes with toe clips, and large nails (which stop up all the minute nutritive canals in their course, and so render the hoof brittle) lead to sand cracks. Cracks also sometimes follow other diseases as suppurative corns, canker, grease and quittors. Even in healthy hoofs fast running on hard roads, pulling an overload, or a blow on the coronet may bring on this disease. The lameness is greatest at a fast pace and least at a walk.

Having once developed toe crack the animal will keep growing worse and worse unless carefully attended to. In the case of toe crack, the horse, in placing his weight upon the foot, closes the crack, and when he raises the foot, the crack opens. The exact opposite is the case in quarter crack. The horse's shoes should be removed, and the walls of the crack trimmed off to take off the bearing from both sides of the crack. The sides of the crack must be cut off the whole length. A transverse cut burned through the crack at about one inch below the coronet favors the growth of new hoof. If the flesh comes through at the crack, it is liable to be bruised at each opening or closing, so a good veterinarian should be called in.

Many devices have been introduced in the way of plates and shoes for sand cracks. The one aim of all is to keep the edges of the crack rigid and to prevent spreading. The crack may be closed with nails, which are clinched. The plates and clips for this purpose may be had anywhere that veterinary instruments are made. A shoe should be used that has weight enough to keep the hoof from spreading. In the case of toe cracks a bar shoe with clips at the sides of the crack should be used. For quarter cracks the clips should be at the quarters. Another device is to shoe with a bar shoe furnished with bands that approach each other over the hoof and through which a bolt is passed to bolt the hoof together. If provided with toe clips, I consider this shoe the best that has been made for sand cracks. In order to prevent concussion it is well to shoe with sharp calks.

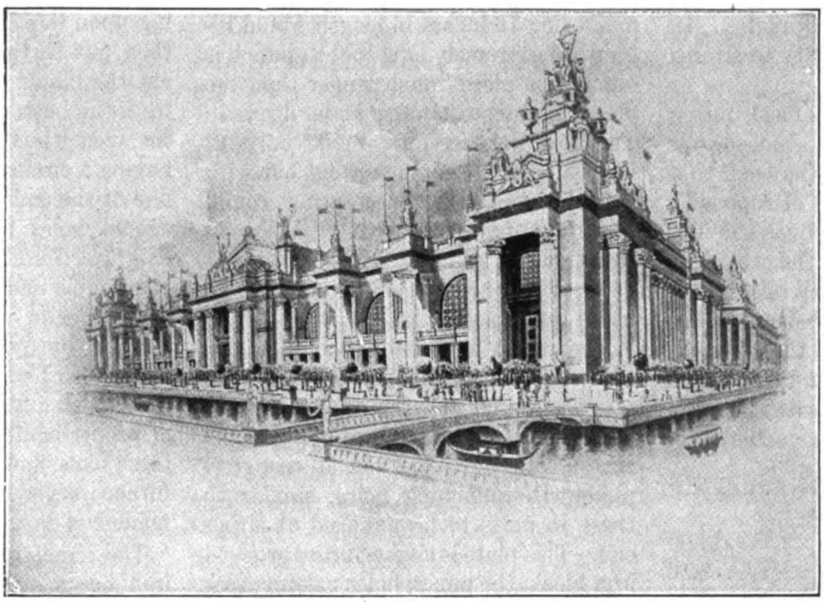
A Simple Method of Removing Rusty Screws.

A contemporary recommends the following method of removing rusty screws by applying heat: Heat a piece of iron—a rod, poker or any other object available, to redness, and apply to the head of the screw until the latter is hot. The screw may then be removed with ease by an ordinary screw-driver. Screws that are greased before inserting are more easily removed than those driven without greasing.

The Electricity Building at the World's Fair.

A very good example of the bigness of some of the structures at the World's Fair may be had from the report that the Electricity Building alone consumed 185 tons of iron and steel in its construction.

The accompanying half-tone shows this building when complete. The design is a bold, classic one and was planned by Walker and Kimball of Boston and Omaha. It is situated on the main central avenue, and forms a very important, in fact, one of the chief elements in the main exposition picture. The doors are of immense proportions, being 11 by 18 feet. The whole structure possesses 176 trusses, the largest span being 82 feet in length. The building is well suited to represent this important branch of modern investigation.



THE ELECTRICITY BUILDING AT THE WORLD'S FAIR, ST. LOUIS.

The exhibits in this building will be most interesting to the scientifically inclined. It is reported that Mr. Edison, the "Wizard" will exhibit some of his newest inventions in electricity. In the western bay will be a tremendous traveling crane, which will be used in the installation of the big electrical machinery to be shown in the building.

Something About Shoeing Oxen.

R. PHILLIPS.

In the foot of the ox, the long pastern, short pastern and hoof bone are all double. Thus the whole foot consists of two parts—two claws or hoofs distinguished as outer and inner. The ox has no frog, the hoof consisting of wall, sole and bulbs. On the ox the wall is much thinner than that of the horse and the sole is thinner. The bulbs are low.

The shoe for an ox's claw must be thin but wide. The holes must be fine, and short, strong nails used. A tongue-like piece is attached to the inner side of the shoe and bent up and outward over the hoof. Also, a small clip may be used on the outer side of each toe, and drawn up close to the toe of the hoof. Although these shoes are not easy to make, they

are, I think, the best in the end.

Some shoers use undivided shoes for oxen, but nature has made the foot of the ox with two claws for a reason, and this kind of shoe prevents the free movements of the two claws. The only good that I can see in such a shoe is for use on rough roads with heavy draught. In this case there is less liability to strains of the joints of the foot.

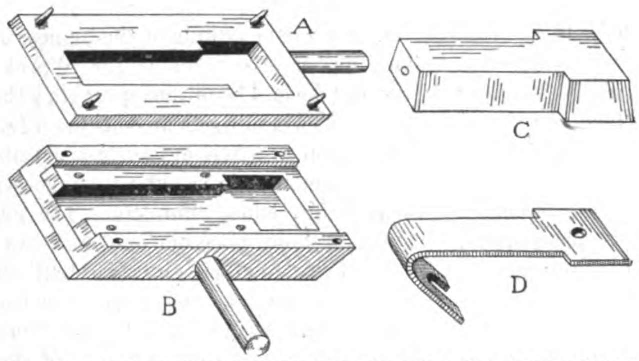


Fig. 50. TOOLS USED TO ECONOMIZE TIME IN MAKING A LOCOMOTIVE BRAKE SHOE SPRING.

Oxen are difficult to manage during the operation of shoeing. Indeed it is often necessary to fasten the head to a tree or other solid object. A rope with a slip-noose is then passed over the fetlock, across the withers to the other side and held by an assistant. To raise a hind limb, place a round pole in front of the hock and let two men hold the leg backward and upward. Light taps with a stick at the base of the horns will often effectually quiet an unmanageable ox.

Prices Charged in Nebraska.

M. W. MATTIESON.

Plow work 16-inch lay	$4.00
" " 14 " "	3.50
Sharpening plow lay	.25
Pointing cultivator shovels, per set	2.00
Sharpening cultivator shovels, per set	.50
Horseshoeing, new shoes, each	.50
Setting discs	.25
Sharpening discs, 18-inch, each	.30

The Railroad Blacksmith Shop.—13.

W. B. REID.

Tools in the Blacksmith Shop.

Many of the lighter, standard forgings can be made very economically, in quantities, by simple tools adapted for the purpose. Although seemingly trivial in character, tools of this order are invaluable in keeping the work of the shop ahead, and securing thereby a surplus margin of time for doing work of a promiscuous kind which must necessarily be done by hand. Fig. 50 shows a locomotive brake shoe spring largely used. To make this simple article "by hand" would occupy a blacksmith and helper one hour at least. Heating the plates in a small furnace and using the tools shown in Figs. 50 and 51, from eight to twelve could be made in the same time, a much superior job resulting.

The cutting tool (Fig. 50, A), is a cast steel plate, cut out to shape of the spring (Fig. 50, D), and riveted into a grooved iron block. At B, Fig. 50, is the guide plate, for the punch shown at C, which is adjusted in position when punching by dowell pins, upon top of part A.

The straight stock of spring (Fig. 50, D), measuring 16 inches in length would require an extremely long tool to punch it out in one piece, much longer than the dies of the steam hammer at our disposal. The tool is, therefore, made only 12 inches long. This much is cut out with one operation, the piece turned round and the balance of it cut with second stroke of the hammer. The tool is left open, it will be noticed, at one end, to make this practicable.

The round and oblong holes at the ends of the spring are punched in a separate tool, (Fig. 51), the construction of which will appear plainly from the sketch. It consists of a small cast steel plate with punching holes, similar to those in parts to be punched at either end. This plate is riveted into a grooved iron block, the punch holes passing clear through both. The U-piece of iron riveted on top is simply to guide the end of the spring while the oblong hole is being punched. The square recess at the opposite end serves the same purpose in punching the round hole. With the guide plate (B, Fig. 51) in position on top of the part shown at A, each end of the spring can be alternately slipped in freely and punched with perfect accuracy. The bending of the ends of springs is done quickly, in a simple "former" fixed in the anvil.

Locomotive oil cup wrenches have to be made in large numbers in many railroad shops. These vary in style on different roads. Those made by the writer are of $\frac{3}{8}$-inch or $\frac{1}{2}$-inch boiler plate stamped out in shapes as shown in Fig. 53 at A and B. The style of tool used is shown in Fig. 52, consisting of a hardened, mild steel plate around which an iron band, with handles attached, is shrunken to strengthen the cutting plate and facilitate handling. This band, extending sufficiently high above the plate, also holds the guide plate of the punch in position, dispensing with dowell pins. The boiler plate from which the wrench is made is placed in the cavity of the tool, the guide plate at A resting upon it. The punch seen at B is then put in the guide plate, stamping out the blank wrench, which drops out from the bottom. With the same heat the wrench is completed in separate tools having a circular recess to hold the outline of the end of the wrench, and hexagonal holes for punching the same, (Fig. 53, C and D). The two holes in the double end of the wrench being so close together, have to be punched simultaneously with one stroke of the hammer. The wrench (See B, Fig. 53), is stamped out in the same way, in tools of proper conformation. By means of these tools, and heating the plates in the furnace, several hundreds of these can be made in a day.

The circular end of the top plate of iron has a steel shear plate of proper proportion riveted into it, which, guided by the dowell pins into the part at A, shears the end and forms the offset. The punch inserted and driven through, completes the piece. The drawing will, I think, make the operation of the tool perfectly plain.

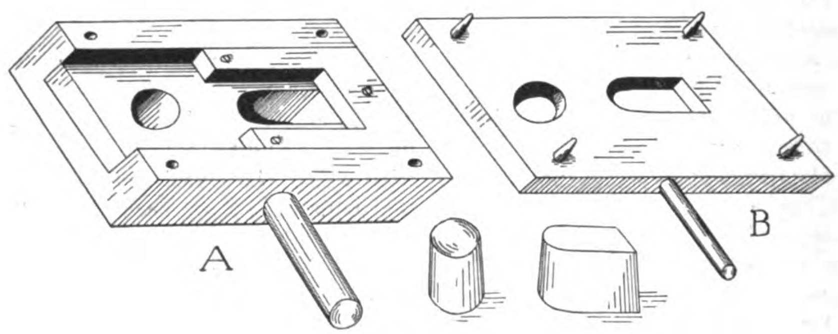


Fig. 51. TOOLS FOR PUNCHING THE ROUND AND OBLONG HOLES IN THE SPRING.

The time spent in forging such tools as those described will be more than repaid by the time saved in operating

them. Other devices of a similar nature may be invented by the ingenious man who has the time question in consideration. This point is of no small consequence in these days of rush and hurry when tools must be turned out with the greatest possible speed.

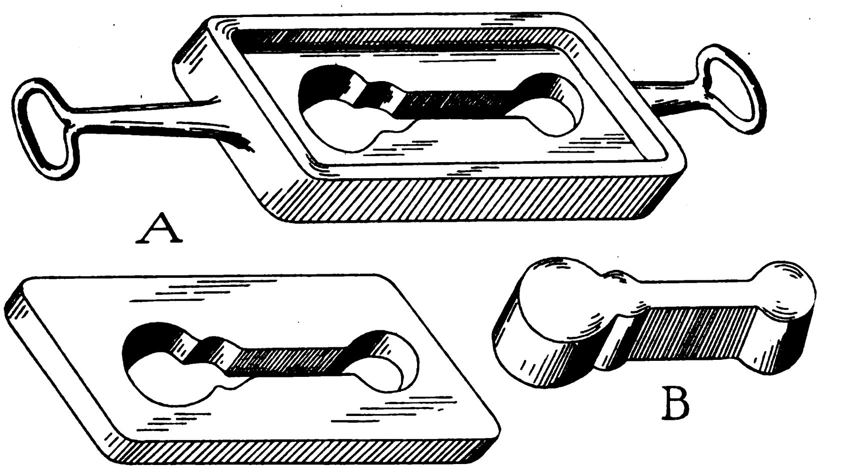


Fig. 52. DIES FOR PUNCHING OUT LOCOMOTIVE OIL CUP WRENCHES.

Building Farm Wagons.

F. W. PRICE.

There is no smith that cannot, if he turns out wagon work far superior to the factories, get as much of such work to do as will profitably fill up all his dull times. I sell all I can build at odd times for as high as seventy dollars each, whereas factory wagons are selling at $53.00.

He Needed It Later.

At Cornell all the mechanical engineering students have to learn seven trades. One of these trades, that of blacksmith, is very distasteful to some of the students; but it has to be learned all the same. One young fellow, who was unusually averse to soiling his hands, begged hard to be exempted from wearing the leather apron; but the professor took special care that there was nothing lacking in the thoroughness of his training at the forge.

Last fall the student went to the professor and thanked him for being compelled to learn blacksmithing. "You see," he said, "I am now superintendent of a mine away back in Colorado. Last summer our main shaft broke and there was no one in the mine but myself who could weld it. I didn't like the job, but took off my coat and welded that shaft. It wasn't a pretty job, but she's running now."

"If I couldn't have done it, I'd have had to pack that shaft on mule-back and send it three hundred miles over the mountains to be fixed; and the mine would have had to shut down till it got back. My ability to mend that shaft raised me in the eyes of every man in the mine, and the boss raised my salary."—*Selected.*

Setting Heavy Tires.

E. C. FAY.

Having had 32 years' experience in ironing heavy wagons, it might benefit some of THE AMERICAN BLACKSMITH readers to let them know my way of putting up heavy tires, as I use mostly 3½ x ¾. I will explain how I manage that size. Lay the four bars on the floor. Take one wheel and carefully run it on a bar and get the exact length for tire for that wheel. Then mark the bar 1¾ inch longer than the wheel measures, as it takes up that much in bending. Mark wheel and bar alike, as the wheels generally vary in size. Mark off each tire the size of the wheel it is to go on. Heat the tire at mark, cut off, scarf both ends, and punch ⅜-in. hole about the middle of scarf. When the four are ready to bend, use a short pattern of the felloe and as you begin to bend the tire on the pattern see if the circle is just right for the wheel. When bent the ends should come nicely together. If the tire should twist and not come in line, lay it on the floor, place the end of a lever under the lower end, have your helper place another lever under the first near the tire. By both bearing down, take out the twist. Be sure and have the ends come nicely together or you will have trouble when you come to weld. Place the tire in a large, clean fire and heat to nearly welding heat. Remove to anvil and set the scarfs together; tighten the rivet, return to fire and keep it well covered, frequently sanding the edges to keep from burning. Take a good heat, then have your helper sledge it down. Run the tire and give ½ inch draft with heat for a well built wheel. I have put up eight sets at one time and did not make a miss on one. Now to end, be very careful of the minor details if you would succeed.

American Horseshoes in Philippines.

It is reported that there are about 30,000 American horses in the Philippines, and that American shoes are used on their feet. Plain flat shoes, hind and front are employed, and the horseshoers get in the neighborhood of seventy-five dollars per month. The shoeing in Manila is done mostly by the natives, and many of them are quite intelligent.

Reading for the Employe.

One movement in some of our large business houses is towards the establishment of reading rooms for employes. Many large concerns have adopted this system and the results are evidently found to be satisfactory. Reading helps to make people intelligent, and good reading tends to make intelligent people brighter.

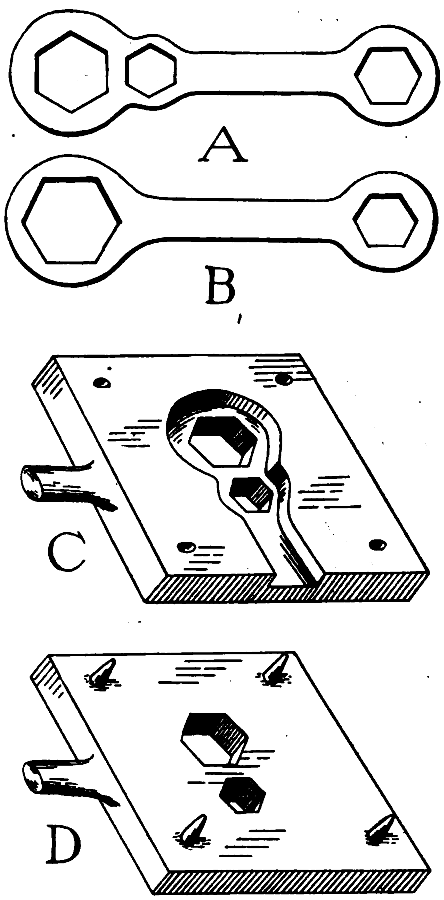


Fig. 53. THE FINAL PROCESS OF PUNCHING THE HOLES IN THE WRENCHES, AND TOOLS USED.

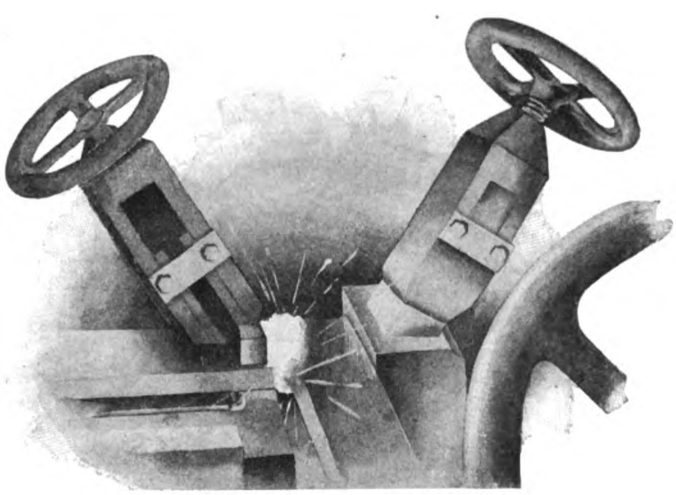
Of course reading rooms are hardly to

be thought of in a blacksmith or forge shop, but at least the smith or foreman may exert a considerable influence over his apprentices or assistants by encouraging them to read good books and papers. A supply of the current craft journals should always be on hand and accessible to every employe during lunch hour. When a number of people all read the same papers, they are led to criticise the contents and to think more about them. Many new ideas and helpful suggestions are thus interchanged and a new interest created in the daily work.

The Advantages of Electric Welding.

Welding by electricity is accomplished by placing the pieces in close contact at the welding point and causing a current of electricity to pass through the ends. These ends form the point of greatest resistance at which is generated a high degree of heat. At the same time, pressure is applied to force the two pieces together, and as the process goes on, the softening ends are pressed closer and closer until a perfect weld is secured.

In the ordinary mode of forge welding, the heat is applied from the outside and gradually reaches the interior. Hence, the outside is welded before the inside and there is no true method for ascertaining whether the interior has been welded or not. Also, the heat travels along the piece, often injuring the metal adjacent to the weld.



CORNER OF CHASE IN PROCESS OF ELECTRIC WELDING.

On the other hand, in electric welding, the heat is developed first in the interior and works outward, so that the inside is perfectly welded before the outside, and when the exterior has been united there is no question about the inside. Another point of advantage of this process is that the whole operation takes place directly under the eyes of the welder, and with experience he is able to accurately gauge and regulate the heat applied. By being able to see just what is taking place, he can also detect and prevent flaws in the weld.

This mode of welding has been very successfully applied to chase making. A special saw is used, that cuts through the tough steel with great ease and rapidity. The corners are then held in position in the jaws of a ponderous clamp, and welded, one at a time. The current is generated in a specially wound dynamo. While cooling the bars are held in a right-angle vise to prevent warping. The surplus steel is then cut away in milling machines and the cross bars, if desired, are adjusted.

The accompanying half-tone for which we are indebted to Barnhart Bros. & Spindler, Chicago, shows the corner of the chase in process of welding by electricity.

Errors in Nailing.

Careless nailing may result in any one of several injuries to the horse's foot. When the nail is driven too close to the quick or into it so that the horse flinches, it should be immediately extracted. This is not a serious case if so treated.

It occasionally happens that the nail is driven still deeper and approaches the soft parts of the hoof, when the nail should, of course, be immediately withdrawn. Another error is in driving the nails somewhat too deep, so that when they are clinched they tend to press inward upon the sensitive parts, and pinching is the result. The cause should always be removed.

It sometimes is the case that the horse does not evince lameness for two or three days after shoeing. When lameness becomes apparent, the foot should be carefully examined and felt to detect heat if present. Then a few light taps around the several nails will allow the smith to detect the offending one, and withdraw it. In ordinary cases, simply leaving this nail out will be sufficient treatment.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Polishing Wheel—Will some one tell me the best way of making a polishing wheel of emery and canvas?
W. H. MONTGOMERY.

High Speed Steel Bath—I should like to ask what kind of oil is best to use as a bath for high speed steel.
W. J. KINCH.

Rubber Tire Machine—I should like to know how to repair rubber tires of buggies, and what kind of a machine is used. Will somebody kindly let me know.
FRANK TEUBER.

Tempering Oils—In reply to Mr. Kinch's question, would say that we use linseed oil but any of the tempering oils can be used with equal success. H. W. RUSHMER.

Shoeing Racks—I should like to ask the experience of brother smiths with shoeing racks, and which they find to be the best, as I have a great many mean broncos to shoe and need a rack.
B. Q. DAVIS.

Tempering Plow Lays—I should like some brother smith to tell me the best recipe for tempering plow lays. I am in a stony country where it is hard to get a plow to stand the rocks.
F. W. NICHOLS.

A Wire-cut Foot—Will some reader of THE AMERICAN BLACKSMITH tell me how to shoe a horse that has been cut on a wire and has a quarter crack, the back part of the hoof being loose and when it grows down to the shoe it makes him lame. Will some one tell me how to stop it? J. D. H.

A Shoeing Question—I should like to ask some of the horse ironers of this big country what is the latest and best way of cutting down the foot, and what kind of nippers or hoof shears are the best. The floor work to me is the hardest and there is less said about it than other points taken up in these columns. O. W. DILTS.

Power in the Shop—I have been working at the trade for five years and like the work. I expect to rebuild this winter and put power in my shop. What would be the proper size for a small repair and horseshoeing shop? I now work in a shop 20 by 38, and find I have no room for a vehicle inside when I have horses to shoe.
D. H. KEENER.

Cash Payments—Mr. A. C. Green, of Boylestown, Ill., writes that in his opinion the principle of cash dealings, if adopted would be of greater benefit than would any lien law. This is a question which is open for controversy, and we should like to hear from

some of our readers as to whether they consider a cash basis the best on which to conduct their business. [EDITOR.]

Paint Brushes—Can any of the carriage painters tell me how to take care of brushes when not in use? I have tried keeping them in water, which makes them work like a rag on the end of a stick. Also turpentine, which takes all the elasticity out of the good ones. The best way which I have found is to rinse all the paint or varnish out of them with turpentine and leave dry, but this is quite a job. Can some one suggest a better way? J. W. LAMBERT.

Rule for Calculating Length of Iron—I should like to know a good rule for calculating the length of iron to cut off to make a hoop or ring. If any one will inform us as to this it will greatly oblige us.
THEODORE S. MELANCON.

In reply to the question of T. S. Melancon, a method which I use and which I find is strictly accurate is to take the inside dimensions of the hoop and add to it the thickness of the iron, which is to be bent to make the hoop, and multiply this result by 3½. B.

Drop Forging Dies—These are usually recommended to be made from crucible steel of from 40 to 80 points carbon, the greater the strength required, the greater the carbon needed, or else out of open hearth steel of first class quality. The greatest care must be taken to get a uniform heating and a quick, even cooling when hardening. The temper should be drawn but very little. Several hours in a kettle of boiling water is often recommended. I would like to hear one from some of experience about operating such dies. B. C.

A Clean Fire—I wish some one of the craft would inform me how to get a clean fire. I am using a Sutton's tuyere iron. I used to plaster it with clay, but the clay here is no good for that purpose, so I bought a Goshen fire-pot, and put it in. That does not help the matter any. The fire is very difficult to weld in, being always dull and red instead of white, and when I stop blowing, the fire will die out in a little while. My bellows are in good condition. The coal, however, is not of the very best quality to be had. F. O.

An Interesting Letter—The paper has been a great help to me, in many instances, and every smith should have it to read. I am very much interested in the ornamental iron work, because I worked at the same kind of work for about six years in Germany. I have done some ornamental iron work, in the past, but now I have all I possibly can do of all kinds of work, and my business is increasing every day. I started here only two years ago and I must say that sometimes I thought I should have to put out a sign like the one in the poem in the September AMERICAN BLACKSMITH. But I am satisfied now with the business and need not use that sign. ABRAM ROSKAMP.

A Pennsylvania Letter—Last April fifteen or twenty of the blacksmiths met and organized a union, of which eleven became members, since which time we have been sailing along smoothly. On July 1st, we raised the price of shoeing which was $1.40 at most of the shops, while a few were shoeing for less, up to $1.60 at all union shops. There are some eight or nine shops that would not join the union, but we hope to get some of them in shortly.

I might say that I have a shop 22 by 68 feet and have a large business, having had as high as 26 horses standing there at one time for shoeing. S. G. HEVERLY.

Two Questions—Will some brother smith tell us how to make a tool to bore a cylinder to an engine? We have a lathe and think we could make such a tool, and would like some information as to how it can be made, as I believe such a tool would cost a neat sum of money.

We should like some one to tell us how to build a trip hammer. We should like to make one and have it ready for our spring work.

We are readers of THE AMERICAN BLACKSMITH and value it very highly, and would not do without it for five times the price it costs. We think the paper cannot be beaten as a paper for blacksmiths and allied crafts. S. J. PEMBERTON.

Wooden Axle—In answer to Mr. J. R. McDonald's question on wooden axle, I shall endeavor to state my plan. First get your wood dressed up in perfect shape and proper length, then measure from the ends back the entire length of your thimble in side. I take ½ inch off the bottom if wheels are straight, but if dished take off less. If badly dished have the axle perfectly straight on the bottom, then get your inside measure of spindle at the small end. Measure from bottom of axle, up, the size you want your spindle at the small end. Take your compass, lay off the size of the spindle. For the gather take off ⅛ inch front and ⅜ at back. If this does not seem clear to you, I will try to give you a more clear explanation in a later issue. M. A. FOSTER.

Making Stifle Shoes—I have been waiting for some older smith to answer the question of a brother on a plan to make stifle shoes, but as the same has never been answered, I will give my experience. First take an ordinary horse shoe or mule shoe, as the case demands, weld a piece of ⅜-inch rod iron across the heel about one inch from the calk. Next take the same size rod and circle from toe to the center of the heel piece, and weld to both heel and toe with a four-inch circle, placing it on the well foot. There are various ways of making this shoe, but this is one I have tried and it worked successfully for me. S. W. SHORT.

An Interesting Letter—I received your valuable paper to-day and see that you have given the prize to my shop, and I must say that I am both pleased and surprised, for I thought mine was but a common run of the shops throughout the country and I also think that more shops would be up to date, and look better, if the owner would put in a few of the dull days in picking up old truck that is sure to collect, and making a bonfire once in a while.

I can say to all blacksmiths that they can not invest a dollar any better than to subscribe for THE AMERICAN BLACKSMITH, for I find recipes and directions every month in it that are worth the price of the entire paper per year. JAY B. BAKER.

Emery on Cloth Polishing Wheel—In answer to Mr. Wm. Exline in the September number, would say that the blacksmith under whom I learned applied his glue and then sprinkled on the dust, but, by experience, I have found a better way. Empty a quantity of emery dust, of the desired number into a wide shallow vessel, and having the wheel off of the shaft, apply the glue to the wheel about the space of four or five inches; then roll in emery dust with some pressure on the wheel. Repeat until around the wheel. Let dry and give a second coat. I use Irish glue cooked in double cooker, sufficiently hot and thin. Some experience is required. Don't use glue too thick or the surface will crack. MELVIN BARNETT.

Replacing Tires After Shrinking—A plan which I use for putting on tires may be of use to some brother in the craft. I make the ordinary stand or bench out of two pieces of board placed on end running side by side and two others placed side by side at right angles to the first, making a sort of tit-tat-toe figure. I place my wheel on this bench and by means of a rod coming up through the center I screw the wheel down until the dish is nearly all out. Then I heat, put on the tires and as I cool the tire, drive the spokes with a hammer, setting them in the hub straight. I find this a very quick way and a good one for the amount of work put upon it. It prevents the wheel from dishing, and I have put many a badly dished wheel in good shape in this way. J. L. FIELDS.

To Make Butcher Knives—It may benefit some brother smith to know how I harden and temper butcher knives. I take an old file and file or grind off all the scratches, taking care that all are entirely removed so that there will be none to crack at the edge after hammering. Take a piece of 1⁄16-inch iron twice the length of the file and the same width. Weld this over the steel, and you will have a knife that will not break. Heat to a low red and harden in water until cool. Brighten the knife, hold over a hot iron until brown, and then let it cool. JOHN BLAKE.

Power Hammers for the Smith—I recently read the article "Power for the Blacksmith" in the August AMERICAN BLACKSMITH, and that article bears out what I believe to be the best and cheapest power for small blacksmith shops. May I now be permitted to ask a question? In a blacksmith shop that employs four men all the year round, and having an oil engine, 2½ horse-power, would a trip hammer, "The Little Giant," or similar, be sufficient to work with this power, iron 2½ and 3 inches square, or would it be better to have a boiler and work hammer by steam? Are the "Little Giant" trip hammers or similar hammers equal in power of stroke to a steam hammer, say 1½ or two hundred weight size? EDWARD A. GRANT.

Little Giant Trip Hammers—A 2½ horse-power is more than sufficient power to run our hammer to its full capacity. The hammer will handle 2½ to 3 inches square or round iron to very good advantage. As to comparing our hammer with a certain size steam hammer, will say that this is rather a difficult matter. All trip hammers, whether steam or belt driven, are gauged by the weight of falling parts. Therefore our fifty-pound trip hammer would be equal to a fifty-pound steam hammer, but they do not manufacture steam hammers smaller than one hundred pounds, and while our belt driven power hammer strikes 325 blows per minute, one cannot strike over 100 blows per minute with a steam hammer. MAYER BROS.

Contraction—Noticing in the September number a communication from A. H. as to the contraction of horses' feet, I will give my plan of shoeing what we call a narrow heel, as I learned it from a veterinary surgeon. I take a shoe and bevel it on the top side from both ends for about two inches, making it slope from the inside of the shoe to a feather edge at the outside. I make the shoe just as wide as the foot will bear and in six or eight days you will find the foot spread out over the shoe. Take this shoe off and spread it, replacing the shoe as before. Do this every six or eight days until the foot is spread to its proper width. I find this much better than spreading the shoe after it has been nailed on the foot, as it is a gradual spreading and does not hurt the horse. I have been shoeing for twenty-seven years and think the above the best method that has ever been brought to my notice. J. L. FIELDS.

Interfering and Forging—I should like some brother smith to write his method of shoeing interfering horses which interfere in front. I shod a horse which interfered in

front, striking his knee; for a starter I shod him with a Perkins side weight shoe, weighting the feet on the outside, but he interfered worse than ever.

I find the best results in shoeing a horse for forging are gained as follows: Take a Perkins snow shoe for front and Perkins side weight behind of the same number or size, so as to about equalize the weight on all four feet. After paring the feet level, I shoe the front feet as short as they will stand, rolling the toe as much as possible. Behind I allow the shoe to protrude as far forward as possible, *i. e.*, the hind feet are generally dubbed off. I allow the shoe to protrude far enough in front so that it would fit the hoof if it were not dubbed a particle. I also weld toe on shoe of $\frac{1}{2}$ by $\frac{1}{2}$ calk steel. I have stopped the worst cases in this manner. S. SMITH.

Answer to Chain Puzzle—I will give the following in answer to the chain puzzle by S. W. Short. Let the five pieces of chain be represented by A, B, C, D and E. Cut one link from E and join A and B with the link cut from E. Cut another link from E and join C and D with it. Then take the remaining link of E and join the pieces you have, and you will have made a straight pulling chain with three cuts and three welds.

There is considerable logging in my territory and consequently a great many log wagons to repair. One wagon with 3-inch tire was brought to our shop to have the tire reset. Before the wagon was brought to the shop the tires were very loose and the spokes would creak when loaded. We cut the tires, welded them and replaced them, and they were tight enough to ring when struck with a hammer. The wheels showed plenty of opening when the tire was off, so I don't think the wheels were rim-bound. But in a few days they were loose again. I believe the spokes sunk in the hub, but if I am wrong, will some brother blacksmith correct me? A. J. ROOKS.

Interfering—I see in your October issue that D. W. Cryce asks for some one to give him a pointer on shoeing interfering horses. While I am not a perfect horseshoer yet I think I have an easy plan for such.

I take the size shoe the horse needs (long heel preferred) cut the inside heel off, so that after it is turned up for heels it will barely reach to the frog. The outside I turn up pretty stiff at the heel, and leave it from $\frac{1}{2}$ inch to $\frac{3}{4}$ inches longer than the inside heel and almost $\frac{5}{16}$ inch or $\frac{1}{4}$ inch higher than the toe. I let it extend over the outside a trifle. By doing this it will throw the ankles together and naturally the horse will pick his front foot up and throw it out away from the other ankle. Fit the shoe flush with the foot on the inside. I have used this method for about ten or twelve years and it has always proved to remedy the fault, if not the first time, the second. I have been at blacksmithing going on twenty-one years and have had quite an experience with good smiths. ANON.

The Blacksmithing Craft—I fully realize how much organization is needed at the present time. I find it very difficult to get good help. I notice, too, that very few are learning the trade, and I do not wonder at it as present prices for shoeing in this county are not encouraging for young men to learn the business. About all the blacksmiths and horseshoers that understand their business and are steady and trusty are doing business for themselves, or have good positions, and I often wonder what will happen in the near future, if something is not done in the way of organization and better prices so as to encourage the young fellows to learn the trade. I am trusting that the craft will wake up to the fact that something must be done soon. I fully realize that the art of horseshoeing is one which should be "looked up to," as it requires some natural ingenuity, lots of study and common sense, and where is there a profession on the face of the earth to-day so misused and looked down on as that of horseshoeing? A. S. DARROW.

About the Prize Contest—I wish to thank you for the prompt way in which you answered my question on blackboards. I also intend writing an article for the prize contest, now on, and I wish to know if I may send more than one article and what length it would be. Also if new work and repair work may be mixed in the one article. Kindly let me know soon. GEO. E. BRIERLY.

In Reply—In answer to the question of Mr. Geo. E. Brierly, more than one article may be sent in competition, in fact, as many as desired in order to increase the chance of winning a prize. As to length, there is no particular limit, except that the subject should be treated clearly and thoroughly, yet without any unnecessary words. From five hundred to one thousand words would be a very good length. Of course, where necessary to make the points clear, pencil sketches or drawings would make the matter more acceptable.

As to mixing new and repair work in the same article, this of course could be done if desired and the subject seems to call for it. The articles will be judged by their practical use, value and information to the man in the shop in his every-day work. ED.

Link Warping—I have noted Mr. A. W. McCaslin's common mention on the matter of case hardening in reply to my recent request. While I appreciate his efforts to aid me in this matter, I conclude from his remarks that he does not understand the real nature of the trouble as I endeavored to explain it. The trouble is not with the link springing, which he speaks of, but with what might be called swelling, as the block face of the link rises up toward the center.

I shall try to explain more fully what I mean. Supposing the link face is three inches in width. I find when the link is hardened that upon laying a straight edge across the face it is perfectly straight at the end, but from this point begins to rise, gradually increasing as it approaches the middle of the link and diminishes. of course, from this point to straight again at the opposite end, or in other words the link face is convexed in the center.

The four essentials of which Mr. McCaslin speaks are worthy of attention, for I find that a forging which has been thoroughly annealed keeps its shape much truer when hardened than one which has not been submitted to a second heating after forging. The above is my difficulty. GEORGE FROST.

Preparing and Working Scrap*—To produce good material for the important members of train service, referred to this committee, is an important subject, as the producing of good material has to pass through many operations before the finished product is completed; and each operation should be carefully guarded, particularly the initial point, that of piling the scrap material. We cannot produce good material from a poor quality of scrap, for the important members of locomotives referred to in this report.

In putting up the 160 or 200-pound piles to produce the forging required, the best quality of scrap iron only should be selected. If any foreign substance that has no affinity to iron adheres to the surface of the scrap, it should be removed before being placed in the pile. Another important factor is placing the scraps so that each piece shall lap, and, if practical, also placing the fibre of the pieces in the same direction that the forging is to be elongated, as good fibrous iron is what is desired. There is so much low carbon steel at the present time that gets mixed with iron in our scrap piles that it requires an expert to determine, in its rusty state, the steel from iron. In no case should steel of any kind be permitted to be placed in the pile, for the reason that steel will not stand such a high heat as is required to weld the iron into a solid mass. In other words, the steel will disintegrate when brought to the heat that is required to thoroughly weld the iron.

The next operation is to place the pile in the furnace, bring the same to the proper heat for manipulating under the steam hammer. The fuel used to bring the metal to the proper heat for manipulating is an important factor. Oftentimes the coal used contains a large per cent. of sulphur. Such coal should not be used for any purpose where welding heats are required, particularly scrap piles in a furnace, as the heated pile will absorb the sulphur or other elements that have no affinity to iron, which is so detrimental to iron. In the Southern Pacific shops crude oil has been recently introduced for the purpose of producing finished products from scrap material, and, from the writer's point of view, is far superior to coal, as well as more economical. The heats come out of the furnace much cleaner than with coal. The furnace should be so constructed that perfect combustion takes place before the heated gases come in contact with the metal. The white flame alone should come in contact with the metal.

The time required to bring the piles to the proper heat must be governed by the dimensions of the piles, which should be heated no faster than they will absorb the heat. Oftentimes the zeal of the heater will cause him to bring his heats out of the furnace quickly, or before the metal is properly heated through. If this work is done too quickly, the outside of the metal becomes hot before the center of the pile, consequently when the metal is worked under the hammer the center of the pile is not thoroughly welded. The heater should take great care in manipulating the piles in the furnace. Should any foreign substance, such as silica from the furnace bottom, adhere to the piles in their heated state, it should be removed before the hammer comes in contact with the heated metal.

The proper manipulation under the hammer is also an important factor. The pile should first be squared up with light blows, then drawn carefully to the dimensions required. If the pile is of sufficient weight to produce any special forging required and is intended for the purpose, it should first be squared and upended at the same heat, then returned to the furnace and heated through its entire bulk, again placed under the hammer and worked into the shape required. For large forgings that one pile cannot be conveniently manipulated, the piles should be drawn into slabs and the slabs piled in sufficient quantities to produce the forging required.

Hammered iron for V-shaped pieces for welding frames should be of the best quality and stand a high heat, and the fibre of the "V" should run in the direction of the lengthwise of the bar or frame it is intended to weld. The method adopted in the S. P. shops to produce the V-shaped pieces is to first produce slabs about 8 inches wide and 3 inches thick, then cut the bar into sections of 3 or 4 inches. This gives a piece of iron 8 inches long and 3 inches square, with the fibre running at right angles to its length.

S. UREN, Chairman of Committee.

*Read before the Convention of the N. R. M. B. A. at Buffalo.

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A Toast to the Holidays.

May the coming Christmastide bring to all friends and readers of THE AMERICAN BLACKSMITH a season of abundance, of gladness, of wholesome large heartedness, together with a sense of peace and contentment, all of these the fruits of an old year of honest toil and a new year of brightest prospects!

Last Days of the Prize Contest.

Have you sent in your article on wagon building or repairing yet? December 12th is the last day of the contest, so that if you care to have a chance for one of the ten prizes, your article should be mailed at once to the Editor. Address P. O. Drawer 974, Buffalo, N.Y.

Take any interesting topic connected with wagon work, and write about it in a straightforward way. The articles will be judged for the value of the practical hints and information contained.

Don't forget to mail your article by Saturday, December 12th.

Choosing Text Books.

Perhaps no single year has produced so many good craft text-books as the year 1903.

Their name is legion and they deal with every art and craft known to modern civilization. Looking over our library and noting all those new-comers, leads to many thoughts. In the first place, the tendency towards education of the tradesman is in evidence. A few generations ago, and the blacksmith's work was a mere matter of drudgery and experience, now it is thought worthy the attention of scientific men, and its principles are laid down according to scientific system. And who writes these blacksmithing books? The practical and intelligent blacksmith who has become an expert, and acknowledged authority in his trade. Besides the excellent books placed before the public, unfortunately there are many of inferior quality. A book whose teaching is not absolutely accurate and trustworthy is more than useless; it is dangerous. Any man who undertakes to write a book should consider the responsibility attaching to his work. And any craftsman, in choosing a text-book for instruction in his craft, should carefully select his book from the best on the subject. A book published by a thoroughly reliable firm, and written by a man of standing is the one to select.

The present system in vogue among some of our leading publishers of "If you like it keep it, if not send it back," is a godsend to the mechanic of literary bent. By this practice he is able to unerringly choose just what he needs. His library becomes a collection of well-tried friends, always ready with advice and always up-to-date with the current thought of his trade.

Unity and Discord.

Seven brothers once lived in a certain place, making shoes for all those in the land 'round about. They were the only people in the land who were skilled in the trade, so that their shoes brought a good price, giving all of them plenty to do and a good living from their industry. These brothers were wise. They worked together and rejoiced each in the other's prosperity. They knew what their skill and labor were worth, and they made the farmers and others pay it. Here was unity, and unity was prosperity.

In another land lived seven other brothers, also shoe makers. These seven likewise had all the trade in their land, but each was foolish, and exceeding jealous of every penny earned by another. So they strove to best one another, not by their skill and industry, but by selling their goods each a little cheaper than the other. They thought to get the best of each other, but the farmers and the butchers and the bakers 'round about got the best of them all, laughing up their sleeves continually at the brothers. Things went from bad to worse with these, until finally some sold out to take up trades where their shoeing skill went for naught, and the others sold their services to the farmers, or struggled on, living from hand to mouth and fighting those who took their brothers' places. Surely, a house divided against itself cannot stand. Here was discord and ruin.

Random Thoughts on Blacksmithing.

Blacksmithing may be called one of the foundation crafts. Not only because of its dating back to Biblical times when the machinists or moulders were undreamed of, but because the blacksmith's work precedes, underlies or plays such a fundamental, indespensable part of so many crafts. The time-worn legend of Solomon and the smith aptly illustrates this.

The blacksmith must use head as well as hands. In his craft, strength, skill and "know how" work together. The smith of to-day is coming more and more to lay out and plan his work. The blue-print is a familiar acquaintance. Foremen are chosen, not from the size of their biceps, but from their ability to lay out work intelligently, to handle men successfully, and to get up tools or methods of doing work rapidly and cheaply. It is another evidence of the ascendency of mind over matter. Are blacksmiths of to-day striving to improve mind as well as muscle?

Where is the blacksmith's machine which, after it has been adjusted and started to work, will allow him to sit down and read the paper? The smith must be constantly at it, heating one iron while he is working another. His forging machines supply brute strength principally—they are not automatic in the sense of machinists' tools, and require continuous watching over.

Blacksmithing requires the use of the head and of the hand. Those who pursue it are subjected to hard work in trying situations, hot work, dirty work, extremes of temperature.

Blacksmithing, therefore, should be paid on a scale of wages equal to those of any other mechanic. Every good blacksmith rightfully earns and richly deserves a good living from his labors.

Price Schedule from Mississippi.

D. C. HOBSON.

Four new shoes	$ 1.00
Four old shoes	.60
Four new wheels	12.00
Spoking one wheel	2.50
Four buggy stubs, 1"	6.00
Shaping rock drills	.50
Buggy reach, each	1.00
Setting wagon tires	2.00
Setting buggy tires	3.00

Three Masterpieces in Ornamental Iron Work.

From Long Island City comes another group of handsome pieces of ornamental iron.

Of the three reproduced herewith, the lower is a particularly fine grille in the Astoria Hotel, Astor Court, of which H. J. Hordenberg is the architect.

The upper one is a staircase of cast iron of which the balustrade is of highly artistic design and workmanship. This staircase is to be seen in the Townsend Building, situated in New York City.

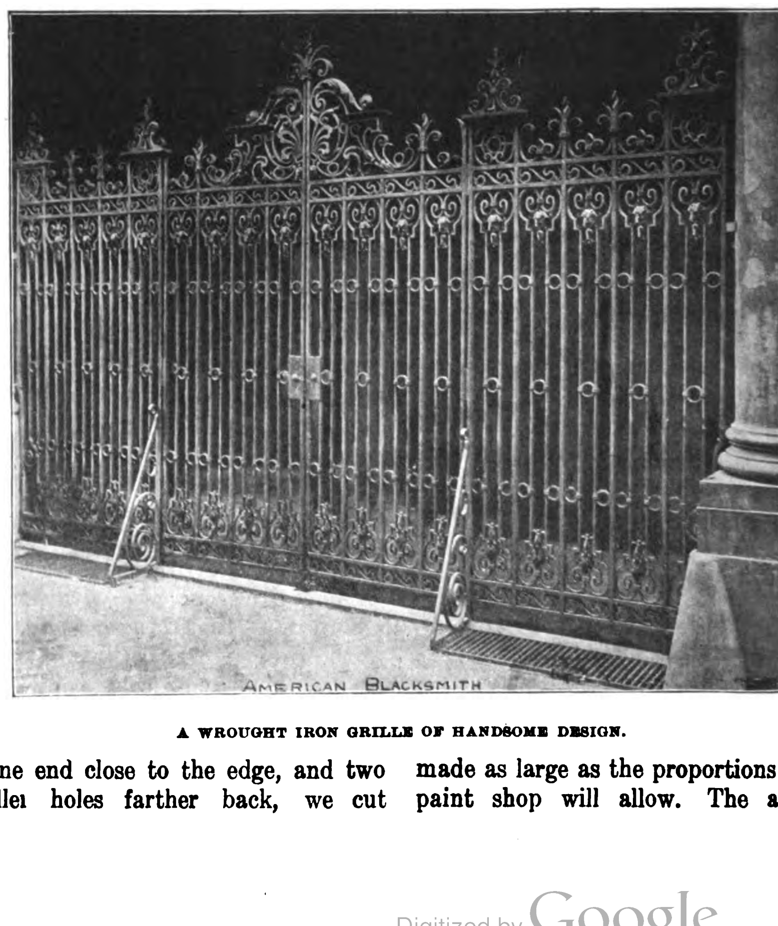
AN ORNAMENTAL STAIRCASE IN CAST IRON.

A second stair rail of very striking design is also illustrated on page 43. All three pieces are from the forge of Richey, Browne and Donald.

Punching Holes in Iron.

BY H. S.

As we had a piece of iron $\frac{3}{8}$ by $2\frac{1}{2}$ inches, in which to punch a 1-inch hole in one end close to the edge, and two smallei holes farther back, we cut the iron and took a good heat and then tried to punch the large hole, but the iron split on both ends. We did not know what to do, but after studying a little time, I came to the conclusion to punch the large holes first and then cut it off. By doing this, in a good many cases, a smith saves a lot of iron and time.



A WROUGHT IRON GRILLE OF HANDSOME DESIGN.

Talks to the Jobbing Shop Painter.—9.

The Varnish Room.—Its Location Light, Ventilation. Cleanliness Heat and General Arrangement.

M. C. HILLICK.

In the September issue of THE AMERICAN BLACKSMITH, Mr. C. D. Briddell asks some brother smith to tell how to build a varnish room, advising size, how planned and equipped, and how much light it should have. Mr. Briddell states that his shop is 25 x 40 feet, two stories high, and wishes the varnish room large enough to accommodate from five to eight buggies at a time.

The writer is not a blacksmith, but as a painter with nineteen years' familiarity with paint shops and varnish rooms, he may perhaps be able to advance some points relative to the varnish room and its requirements which may prove of general interest.

In arranging for the varnish room, at least four important considerations are involved, namely, size, location, light and ventilation.

In size, the varnish room should be made as large as the proportions of the paint shop will allow. The average

varnish room is too small rather than too large. In the paint room the parts of a carriage may be put away in much closer compass than in the varnish room. Paint dries out of the way of dust quicker than varnish, thus permitting an earlier handling of the parts coated. In the varnish room there must be room given for free handling of the work without menacing the cleanliness of freshly varnished surfaces. In the varnish room where new work is handled exclusively more work can be taken care of, in proportion to size of shop than where old work is handled. New carriages, when passing through the paint shop, are taken apart much more completely than old ones, and the storage can therefore be made much more compact without injury to the quality of the work.

Most paint shops of fair size are provided with a varnish room for bodies, and one for running parts, which include gears, wheels and shafts. This, of course, is the most satisfactory arrangement, but in case of the small jobbing shop, this plan, however excellent it may be, cannot always be adhered to. Especially is this true in its application to the shop that carries only from five to eight buggies at a time to be painted. But even in this case the writer would advise making one varnish room for running parts, and one for bodies, as eventually it will prove the wiser plan.

A fair sized varnish room for bodies in a good city shop would be 25 x 35 feet. Mr. Briddell in stating his wants fails to say whether he desires to divide a portion of the 25 x 40-foot space for a varnish room, or whether an addition to this space is to be provided as a varnish room. It is assumed, however, that a portion of the 25 x 40-foot space is to be set apart, and that a room in which to varnish bodies, and one in which to varnish running parts, is preferred to a single room for both branches of varnishing. Accepting this as the situation, we would say make the varnish room for bodies 10 x 15 feet, and the varnish room for running parts 15 x 15 feet. This leaves paint shop proper 25 x 25 feet.

The varnish room should not be located over the smith shop. In fact, it should be as far removed from the smith shop as possible. Blacksmith shop smoke and gases are fatally destructive to high-class varnish room results. At the same time, the fact must be recognized that in the country shop undesirable conditions are not infrequently unavoidable, and one of these conditions sometimes brings the varnish room, or the paint shop in which the varnishing is done, directly over the smith shop, in which case it only remains to reduce the element of danger to the minimum. The varnish room located over the smith shop should have a double matched floor with heavy building paper between the two floors. It should be an unusually tight room in respect of walls, window casings, etc., so that the exclusion of smoke, gases and bad air may be made quite complete. Then from the roof of the building should come a generous supply of ventilation. But conservatively speaking, the varnish room located in close proximity to the smith shop is indeed in a critical situation.

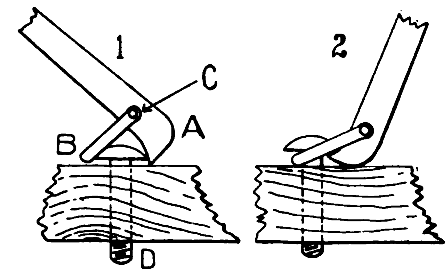
The light for the varnish room should preferably come from the north and east, hence the varnish room located in the north-east corner of the shop may be considered the most advantageously located. The North light is the best light. It is the easiest light for the eyes, being free from the glare of the south and west light. From the north the light comes more uniform, and is of a softer quality, and dries varnish—in so far as the light promotes the drying of varnish—faster than light coming from other points of the compass. Light from the east windows has the advantage of bringing a bit of sunshine into the room in the early morning, passing out after a brief interval, with an effect upon the work and the workman always beneficial.

The varnish room cannot have too much light. It is therefore desirable that a good measure of window space be given. For the east windows furnish light-yellow shades; for the north windows dark-blue shades. The light-yellow shades serve to break and mellow the bright glare of the sun, and the blue shade softens and graduates the north light, and when necessary—during the heroic reign of the fly, for example—they may be used to darken the room, while the varnish is setting, free from dust.

Ventilation is an all-important as a matter of fact, we may say, indispensable factor to be accounted for in the varnish room. Ventilation should come through the ceiling of the varnish room, and so out through the roof of the shop. The old-fashioned top or revolving ventilator, while perhaps quite a little less effective than some of the re-recently patented ones, will do good work. Bring the pipe from the ventilator through the ceiling and into the varnish room, enclosing the end in a wire sieve

DIAGONAL SCHEME FOR ORNAMENTAL IRON STAIR RAILING.

cap which can be removed at the will of the workman. While varnishing is going on have the sieve extremity of the pipe filled with trimmer's curled hair washed clean. This affords adequate ventilation attended by no risk of the work's catching a smear of dirt. This



AN INGENIOUS TOOL FOR PULLING WAGON BOLTS.

method of ventilation removes all foul or poisonous air from the room without draughts, without an inflow of cold air through the windows, and furnishes absolute cleanliness. And cleanliness the varnish room must have. As aids to maintaining the clean varnish room make the floor of hard wood, matched stuff, so that, when necessary, it may be mopped and washed. Give the floor an oil finish. The ceiling and side walls should be of matched lumber of good quality, and as a means of reflecting light, paint the ceiling white or straw color. Finish side walls in oil. Plaster or painted side walls are objectionable on the ground that they bruise and disfigure readily, making a bad effect, and, in case of the plastered wall, making dirt as well. Furnish the varnish room and especially the body varnish room, with as many windows as possible, both north and east. Hang the sashes with weights. Make the varnish room door, or doors, to swing outward so that no dirt will be stirred into the room. Locate the stove, if heat must be had from that source, near the door, that the air thus entering the room may be warmed ere it comes in contact with the work. The stove should be a hard coal, self-feeder, a clean, and good heater. Of course, the varnish room will need a cupboard in which to keep a can or two of varnish, a brush-keeper containing the varnish brushes, dusters, cups, chamois skin, etc. This should be a plain, compact affair, tight and cleanly, and located near the door. Provide this cupboard with lock and key, that contents may not be at the mercy of the inquisitive. In case two varnish rooms are provided—and this is always advisable—locate the body varnish room in the northeast corner of the shop. At any rate, give it the most desirable location. When work is freshly varnished it is thought to be the best plan by many celebrated finishers to darken the room until the varnish sets free from dust. Then make the room as light as possible.

Varnish hardens more rapidly in the strong light and takes on a deeper brilliancy and a sharper lustre. Revolving trestles, etc., for the varnish room have been illustrated in previous issues of THE AMERICAN BLACKSMITH.

(To be continued.)

A Simple Tool for Taking Out Bolts from a Wagon.

WM. DEGEN.

The following is a description of a simple tool to remove old bolts from any part of a wagon—that is, if you can raise the head enough to put the point under and the clevis over the head. Take an old 1¼-inch axle, make a point in it the shape of a crow-bar, then make a clevis of ½-inch square iron or mild steel. Drill a ⅜-inch hole about 2 inches from the point of the bar and a trifle above the center. Fit your clevis so that it will pass the point about ⅜ inch. Put a ⅜-inch hole through the clevis and bar and it is ready for use. The whole length of the bar is 2½ to 3 feet as may be desired. I have shown this puller to many blacksmiths here in the city and they all have adopted the use of it. Referring to the sketch:

A, is a bar.
B, is a clevis.
C, a bolt through bar and clevis.
D, a bolt in a piece of wood.

Pull the clevis back, put the point of the bar under the bolt head, drop clevis over bolt head and the bar is ready for action. In the first figure is seen the tool in this position. In the second is the tool in the act of pulling the bolt. Bear down till the bolt comes out. If it should happen to be a long bolt, raise the bar up, take a new bite, and so on till the bolt is out.

I have seen many good tools and items in THE AMERICAN BLACKSMITH that were of benefit to me, and I hope this may prove the same to others.

Method of Welding Steel Buggy Springs.

J. GOOGERTY.

In welding steel buggy springs, say 1¼ or 1½ inches wide, the first thing after getting the spring out is to build up a good clean fire, build it up with wet coal, round it up nice and high, and then make an opening in front and leave the coal well rounded at back and on the top as much as convenient, also have some well burned coke handy. Now take the broken ends, lay them in the fire, and get as good a heat as you think it will stand, without burning, take one out and upset it by driving it back with hand hammer as much as the heat will stand, then lay it back and repeat the same way with the other.

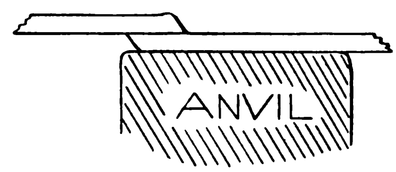
Now take another heat, bring them out and scarf with face of hammer by driving them back with a short bevel from one side, lay them back in the fire with scarfs up, throw a few nice pieces of coke on them and blow up slowly till you get a good red heat, then shut the wind off, take the forge scraper and scrape the coke off. Put on some borax and let it burn down well, turn them over and put some on the other side. Let it lie a little while, and sprinkle on a pinch or two of iron drillings. Now blow up slow and feel the laps with the point of a poker till it begins to stick a little, then turn them over and blow up till you think you have the right heat. Have your helper take one out, and be careful not to drag it on edge of the fire, set it near the inside edge of anvil and set the other piece on, (see accompanying sketch), strike on it with the hand hammer till it sticks, then have your helper come on it with a sledge. Now flatter and swage up the edge nice and smooth, work it down to original size, if it is still hot enough, if not you may heat it again.

A weld of this kind ought to be made in one heat and can be with a little practice, barring accident. At least that should be the aim of every blacksmith; if he fails, then it is time to take the second heat.

Success at the Forge from a Mechanical Standpoint.

J. M. FIX.

In the first place you must have a good fire. Your tuyere iron should be from five to eight inches under the surface, depending upon the character of the work to be performed. Whether bellows or blower, the wind must be



WELDING STEEL BUGGY SPRINGS.

forced through, and a steady blast is best in most cases.

Good coal is essential and also good iron and steel. To make the greatest success attainable by any one, a good soft welding heat is best in most cases for

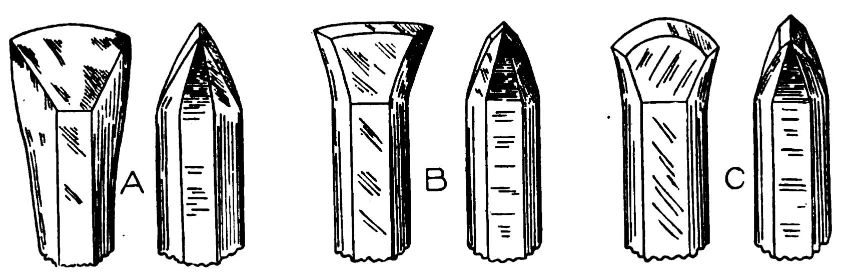
iron. Of course it must be hammered rapidly, and, as a rule, turn it every blow. A rather long hammer is much easier to forge with than a short, thick one. In bending right angles, do not use the vise, nor the sharp corner of your anvil. Heat to a good white welding heat, as a rule, and bend over a round corner, cool one end close down to the heat and drive down with your hammer, having the bend on the anvil. In this manner you can make a good bend at one heat in any ordinary size iron. You can rest assured that when you see a smith rush to the vise to bend his iron, he either does not know or he does not care as to the quality of his work. On account of the surface of your iron coming more in contact with the hammer and rollers, it is tougher on the surface than inside. If you bend in a vise you cut the surface and the least cut in the outer edge destroys the quality of the job from 10 to 75%. It ought to be stronger in the corner than anywhere. To illustrate, suppose you take a piece of iron 1 by ¼ inch, and bend at right angles for a brace, and you cut it in the corner; that iron would not be much stronger than a ⅛ not cut at the corner. I feel from the observations I have made in life that I have not explained this important point thoroughly enough. Working eighteen years at the forge, I have observed, that only about two in ten smiths are up to date in bending iron. Now then, if my observations be correct (and I think they are from a mechanical and scientific standpoint) I have not said enough yet, for not only the user of the products of the shop, but eight out of ten smiths do not know how or else they do not care to make a scientific and mechanical job of bending.

If a corner iron should break, a number of the consumers or users, and quite a percentage of mechanics would attribute the break to bad material in place of poor workmanship.

The Making, Hardening and Tempering of Rock Drills.

W. P. WOODSIDE.

As an experienced rock drill dresser knows, there is more in making a drill bit the proper shape than most smiths think, and to explain to the readers of this paper, they will notice the cuts of drill bits shown herewith. First, you will notice that the bit at A is slightly rounding on the cutting edge with lots of backing behind the corners, and you will notice, side view, the gradual slope from drill body to cutting edge. These three points are very essential in making a good drill. The first point is this, if a drill is made straight across on the cutting edge, often that drill is dull. The next bit, being square or straight on the cutting edge, has to do it all, cutting at first on the very corners, which makes it very hard on a sharp drill. The next point, if you do not have backing behind the corners, as soon as the corners begin to wear, the bit begins to get narrower, therefore, losing its gauge and causing the next sharp drill put into the hole to stick. It is this which causes so many broken bits, or bits with the corners off. This gradual slope makes the bit very easy to sharpen and keep in shape, which means a great deal when the smith is rushed. At B is a very badly-shaped bit. It will show all the bad points which I have just mentioned. The bit at C is also a very poor shape, the cutting edge being too round, making it very hard to sharpen. You will also notice the quick bevel towards cutting edge at A and B which makes them very hard to sharpen and keep in shape.



SHAPING A ROCK DRILL BIT.—A, THE RIGHT FORM. B, C, VERY FAULTY FORMS.

(To be continued.)

Steel—Pointed Paragraphs.

OHIO STATE UNIVERSITY.

"The mastery of iron and steel working implies the ability to master the working of all metallurgical products" —(*Woodward*).

"The treatment of steel is the study of a lifetime."

There is no known process of ascertaining definitely in workshops the quality of steel, except by use. A skillful man can so manipulate a poor piece of steel or iron as to make it appear better than the best grade of either metal.

Tools made of steel depend more upon the temper than the quality of the metal, for testing; but their durability is determined by the quality and manipulation which they undergo.

A piece that will not properly harden by being heated red, and quenched in water, is iron. When it will so harden properly and sensibly, it is steel. (This rule has been sufficient for the toolsmith from time immemorial). Common usage of steel makers includes the product of open hearth and Bessemer furnaces; compounds of iron and its ordinary ingredients which have been cast from a fluid state, which resembles wrought iron, should be called steel; that which is aggregated from pasty masses or from piles not in fluid state, is wrought iron.

Steel is liable to be injured in a very hot fire; a quick heat may rupture it. It becomes decarbonized if left too long in the fire, and should not be over annealed.

The structure may be ruptured more readily at an uneven heat than at any other time.

High carbon steel is more liable to injury than low carbon steel.

Hardening.

Hardening is produced by high heat and sudden cooling. By proper hardening the steel is refined.

Water is not essential for hardening. It improves with use if kept clean.

The hotter the steel and the more sudden the quenching, the more coarsely crystalline will be the fracture.

Oil and fat do not cool the metal as rapidly as water.

Mercury, brine and other substances cool the metal more rapidly than water.

To prevent loss of carbon, tools may be heated in melted glass, or salt and cyanide of potassium or melted lead.

A quick heat and a cold bath may cause the steel to crack.

A rapid cooling gives the status quo, the state into which the steel was brought by heating; the sudden quenching fixes the hot condition, making the metal in a cold state to show itself as it was when hot. (This has from time immemorial been accepted by toolsmiths as the cause of hardening).

The right hardening heat for any steel is fixed by its chemical constituents.

Tempering.

Tempering is a reduction of hardness produced by heating to not more than 700 degrees Fahrenheit.

The ductility and elasticity of steel are restored or increased by temper.

The more slowly the tempering heat is applied the better the article will be.

The higher the tempering heat the softer the piece becomes. If heated by induction the rapid rise in temperature can do no harm.

When steel is properly hardened and polished, the color is a certain test of temper.

Tempering with oil prevents oxidation and increases the elasticity of the piece.

Chemical tempering pickles have nothing to do with the effect.

Defects arise from adhering to any special process of tempering because steel is not uniform.

Case Hardening.

Wrought iron may be exteriorly converted into steel and afterward hardened purposes.

Yellow prussiate of potash or cyanide of potassium, sprinkled on red hot iron before quenching in water gives a hard surface, but it will not stand much wear. More uniform and greater effect is produced by enclosing the article in an iron box containing charcoal, heating to redness which should be maintained for at least one half hour, and quenching the article at a full red heat after it is taken out of the box. Animal charcoal, made of leather, bone or hoofs, packed in the box with salt and steel chips, from drill or lathe cuttings, is best for case hardening.

The Progressive Smith as a Business Man.—3.

BILLY BUNTZ.

The Blacksmith's Day Book.

A carefully itemized record of accounts will save the smith much annoyance and obviate any display of temper. By it he will be enabled to tell who owes him, the amounts, and the dates debts will become due, as well as draw a comparison at any time of the progress he is making, one month or year over another. It will also enable him to readily quote a price on a special job by the account of some customer who was charged for similar work.

Some smiths have the idea that because their hands are usually besmeared they could not keep a record without plastering a book with iron rust, forge smut or axle grease, while others seem to think that to keep accounts requires pretty writing or a regular book-keeper.

The principal thing a debtor wants to know is the amount of his account and what items it includes, regardless of any finger marks, although it may be said here that the smith can avoid smearing a page by using a blotter, piece of paper, or anything of this kind, under his hand, allowing only the pencil to touch the page; or he can wipe his hands on a bit of waste or cloth.

Probably the simplest and most convenient method of keeping accounts in the smith shop is by the pencil system, as pen and ink are unhandy for the average mechanic to use when at work.

While working on a job a slate and pencil are useful for jotting down weights of different kinds of material, number of hours worked, or for making any memorandum, as of course slate pencil figures may easily be erased should a mistake be made. In fact, all accounts may first

(DEBITS) (CREDITS)

Customers who owe	Cash Received	DAY BOOK AND DIARY OF JOHN JONES, 1318 MAIN ST.	Cash paid out	Persons I owe
		Commenced smithing business on June 5, 1901 by buying shop of above number, including machinery and tools.		
		Deed and bill of sale on file.		
		JUNE, 6th.		
		JAMES BARTON, DR.		
1 50		4 shoes for "Nellie."		
		will pay next time comes to town.		
		PAID 6-15		
	50	Straightening sucker rod of pump.		
	75	Making cleats for a boat.		
	35	Tightening shoes.		
1 50	1 60			
		JUNE, 7th.		
		W. E. WILSON, Dr. Porter Road,		
1 50		4 shoes		
		Will pay by 15th.		
		PAID 6-15		
	50	Sharpening scythe.		
		Bo't a hammer.	1 00	
	1 50	4 shoes.		
		Started to build a wagon to have something to do during spare time. Keeping account of time and material in a Memo. book, to afterwards transfer here.		
1 50	2 00		1 00	
		JUNE 8th.		
		Rainy, worked on wagon nearly all day.		
	75	Repairing a buggy.		
	25	Filing a saw.		
	10	Making staple.		
	1 10			

be put on a slate, although this is not really necessary, albeit the memorandum, "Johnson—fifty cents," is a good reminder, as where memory is depended upon altogether something is likely to be overlooked.

In addition to the slate, a Day Book should be kept as a permanent record. This book may be large or small, according to the distribution the smith desires to make of his accounts, although it is best that it have enough pages to contain a year's business, and be sufficiently wide to accommodate large handwriting. The cover may be plain, the paper a little coarse or rough. An indelible pencil should be used, as the record made by a common lead pencil might become obliterated by constant rubbing in handling the pages.

Into the Day Book all accounts should go. In fact, it should include a record of every transaction in the shop, and may also be used as a memorandum book or diary. Its principal use in the smith shop is to show the amount of cash taken in, and the amounts which customers owe. Two columns on right hand side of page are sufficient for showing this information. When a customer pays his account it should be marked "Paid," and the date of payment shown, as well as the amount checked off. It then stands as a complete record. Where all debts have been paid by the end of a month or year, this debtor column is really a record of cash received as well as debts paid, while the regular cash column shows the amounts received when completing jobs, in fact, these two columns show the amount of business the smith is doing, with the exception of the memoranda which show improvements made to shop.

Where the smith desires to show the amount of cash he pays out from time to time, as well as the persons he owes, it is necessary to have two more columns, preferably two columns on either side of the page, those on the left showing Debits, and those on the right Credits. Or there may be any number of columns on either side by using a large book. However, where the smith keeps strict record of the active part of his business, i. e. cash received and paid out, and persons who owe and those he owes, there is little necessity for further distribution or sub-divisions of accounts, as these would show little more than what the smith himself knows all about, as, for instance, how many machines he has in the shop, where they were bought, price paid, etc., or how much he paid for his shop. Transactions of this kind are fully recorded on invoices, bills of sale, deeds, and kept on file at home, the Day Book simply containing reference to their whereabouts without any amounts being shown. Two or three box files with indexes will show nicely for holding papers of this kind.

A date calendar having 365 leaves, like the "Columbia" calendar or that of the Lunkenheimer Co., of Cincinnati, is very handy for keeping memoranda in date order. When a customer says, "I'll pay you on the 10th," his name may be written on the leaf of that number, as well as recorded in the Day Book. A calendar of this kind will accommodate hundreds of memoranda by allowing the leaves to remain

intact instead of tearing them off.

Where the smith has a bank account he can keep record of money expended by adding up the stubs of his check book.

GLIMPSE OF INTERIOR OF SHOP OWNED BY MR. HARRY RUSH.

Private accounts, such as the grocery bill, should be kept at home, preferably by having the grocer render a monthly statement, which may be receipted and put on file.

The accompanying sample page of Day Book illustrates how a smith may commence keeping record of his business transactions at any time without going back into the Dark Ages for any data, as this record dates only from the time it is started, unless the smith especially desires a preface giving general information about his business in former years.

A system of this kind takes up little time, is not at all inconvenient or technical, and is at the same time a complete record of the smith's business and progress, as he can tell at any time how much cash he has received or paid out, as well as who owes him and how much he himself owes.

This system is the same as used by Jones when he first started in the smithing business. Read "Jones as an Advertiser" in the August number of THE AMERICAN BLACKSMITH.

(To be continued.)

A Busy Shop in North Dakota.

HARRY RUSH.

Oberon is situated in the Northern part of the State in a rich farming country. The work is principally plow work, although a blacksmith here must be able to make anything from a spring colter to a threshing machine.

I settled here in the spring of 1884 and have sharpened the plows that have broken up the country hereabouts for miles around. My shop is now 24 by 48 feet with a wood shop 16 by 24 feet, in addition. I have a 6-horse power "White" gasoline engine, made by the Globe Iron Works, Minneapolis, Minn., with which I run a blower for three forges, a "Little Giant" hammer, made by Mayer Bros., Mankato, Minn., a "Silver" lever feed drill from the Silver Manufacturing Co., Salem, Ohio, emery and polishing wheels, shears, upset, and a screw-cutting Barnes lathe. We have also a complete set of bicycle repair tools, including brazer, oven, vulcanizer, etc. A full line of wood-working tools also forms a part of our equipment, with a Silver hub-borer. We run a useful machine for heating tires by kerosene, which is very handy in windy weather. When a job comes to this shop we never say no. We *have to* do it. If I could not have power in my shop I should be ready to quit blacksmithing, and the gasoline engine is the right power. (I mean "White").

With two men and the Mayer hammer I can sharpen two hundred plow shares in a day. In a future article I shall give my method of making a plow share.

A Short Talk About the Moulder's Tools.

Of all the tools that the moulder uses, the most useful are his own hands. These, trained to their task, are capable of performing the most delicate bits of work that other tools would damage. In making an uneven bed or for bedding down a pattern the workman's hands must be used. The whole surface must be gone over in detail to judge of equal consistence or otherwise. By pressure applied with the hands and the addition of more sand, soft places are made firm, and surfaces are roughened by rubbing the palms to and fro over them. In tucking the sand under flanges and ribs and into angles, these tools are used, also in rounding up pouring basins. Broken parts are more safely mended by the fingers, and small patterns are more easily lifted out by hand than with spikes. Besides the hands, several tools are necessary. A hammer, vent wires, various cleaners, head and flange and similar tools are used for shaping.

Molten metal tends to fly off from a hard surface, because the gas present being unable to escape, forms a cushion between the metal and the mould. In a hard-rammed, open mould not vented, the gases bubble through the metal, causing jets or fountains of metal. This bubbling, in a closed mould, will break away the sand in patches, causing scabbing. In a chilled mould not properly dried and rammed the metal will blow out. Hence, a green sand mould should be rammed only sufficiently to sustain the metal. Of course, the pressure is always greatest on the bottom. With green sand a hard bed is necessary. Ram a hard bottom and cover with softer and more open sand. Thus bubbling is prevented, the gas going into the hard bed which is well vented. In thin, shallow castings, soft-ramming at the surface is of more importance than in a deeper one because in the former, there is little counter pressure exerted by the metal to force the gas downward. Harder ramming is necessary in the top than in the bottom, because the pressure there is relieved by the riser while that at the bottom is constant. Ramming may be harder at the sides than at the top or bottom, but care must be taken not to punch the bars, lifter or rods but only the sand. If the pattern is struck by the rammer, it makes undue hardness at that point, causing a scab.

The vent wire is a very important tool. A small vent wire is $\frac{1}{8}$ inch or $\frac{3}{16}$ inch in diameter. A large one is $\frac{1}{4}$ inch to $\frac{3}{8}$ inch. The latter, being long and large, requires the use of both hands to drive it through

ANOTHER VIEW OF MR. RUSH'S SHOP AT OBERON, N. DAKOTA.

the sand, hence, it is furnished with a cross-handle.

A rammer is like a small mallet, having differently shaped heads for different purposes. The part by which the sand is actually punched is from 1 inch by ⅜ inch to 3 inches by 1 inch. Certain kinds of mould dispense with venting, such as loam and open sand. With green sand and dry sand moulds venting is absolutely indispensable. A great deal of gas is always generated by the decomposition of moisture in sand. The amount of this gas is astonishing to anybody but a moulder or chemist. When the mould is poured, from every vent issues hydrogen gas—a sufficient quantity to blow up the whole mould many times over, but for the venting. The necessity for many vents is forced by the fact that the retention of gas sometimes causes minute blow holes which render the whole casting useless. For large masses of sand, it is a good plan to ram up a central portion of sand not too near the surface, producing what is termed "lumpy casting." Ashes make a particularly good vent in dry sand cores, allowing the core to yield to the shrinkage of the metal.

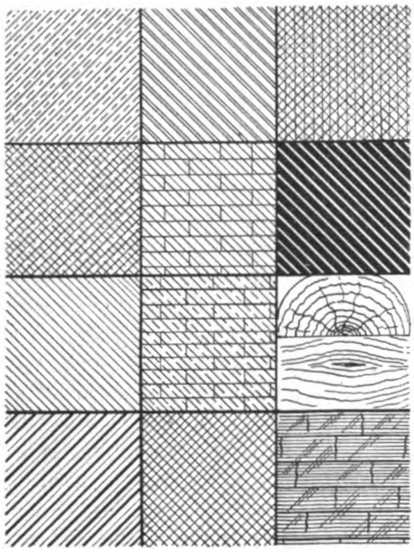


Fig. 1. CONVENTIONAL MODES OF INDICATING MATERIALS.

BRASS.	STEEL.	WIRE.
COPPER.	BRICK.	RUBBER.
CAST IRON.	FIRE BRICK.	WOOD.
WROUGHT IRON.	LEAD OR BABBIT.	STONE.

It is not necessary to touch the pattern in venting; ¼ inch or ½ inch from it (as nearly as practicable to gauge) will be sufficient. The porosity of the sand allows the gas to escape. The closer the sand the more vents will be needed. In bedded-in castings, vents are driven from the bottom, face downward and the surface rubbed over with sand to close the vents. If this is not done, the metal gets into the vents, spoiling the whole casting. The heavier the work the greater may the distance be between the termination of the vents and the surface of the pattern, because the weight of the metal tends to force the gas out. In very thin, light work it is well to bring the vents to the surface.

Lastly, a trowel of ordinary form is necessary for mending, shaping and finishing moulds.

The Elementary Principles of Mechanical Drawing—7.

Conventional Marks.

In order to save time and work on the part of the draftsman, several mechanical conventions have been agreed upon that greatly simplify the work of making and reading mechanical drawings.

To indicate the material of which an object is to be made, the surface is lined in a special way. This device is most commonly employed in sectional views. When an ordinary elevation is presented, the name of the material may be lettered on the surface. Fig. 1 shows the different devices used to represent the more common materials. Still further differences are made for indicating special kinds of wood, but these are not in common use, nor are they necessary except in special drawings.

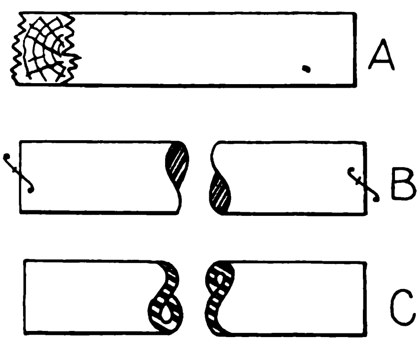


Fig. 2. CONVENTIONAL BREAKS IN DIFFERENT MATERIALS.

When any part of an object is not necessary to the drawing, it is shown as if that part were broken away. Breaks of this kind are represented in various ways according to the materials broken. Fig. 2 shows breaks in different materials. At A is a break in wood. At B is a break in a wrought iron solid cylinder. At C is a break in a hollow steel cylinder.

The more lines upon a drawing, the more complicated will it be, hence it is always desirable to reduce the number to a minimum. This may often be done. For instance in drawing gear wheels, only a portion of the circumference need be toothed (Fig. 3). Likewise a carriage wheel need be only partly finished off. In sectioning pulleys or wheels, only the rims and hubs are sectioned, and when a pulley-arm, the spoke of a wheel or other part is drawn, instead of presenting two views, a section of the part may be placed right upon the surface as shown in Fig. 3, where the spoke of the wheel is sectioned. In a machine drawing, an assembled view is generally given, supplemented by drawings of parts. In the case of a part that occurs more than once, as nuts of the same size and shape, only one need be drawn. The draftsman writes—"four of these—machine steel" or whatever the case may be. All these conventions help to make a drawing cleaner and less complicated for the mechanic who is to construct the tool or machine.

Of screw-threads there are two principal kinds: Triangular and square. The ordinary right-hand screw is drawn with the lines that indicate the thread running from left up to right. When the lines slant down towards the right a left-handed screw is the result. Fig. 4 shows the different conventional ways of representing screw-threads. At A is a double V-thread. At B is a single V-thread. The drawing at C shows a double square thread. D shows a single square left-handed thread, and at E is a thread drawn in the conventional way. This way saves much time and trouble, and is neater and clearer on a drawing than when the thread is defined. The end of the short, heavy line marks the depth of the thread. At F is a conventional thread in use when the screw is very small. The dotted line here shows the bottom of the thread.

Colored ink often adds to the clearness of a drawing, for the colored lines stand apart from the black, thus aiding the eye. The color also adds to the appearance of the drawing. But one special point should be borne in mind—that colored lines must *never* be broken.

Finally the "finish" mark is added.

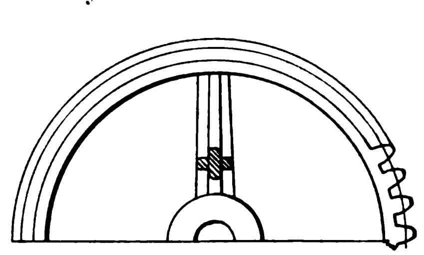


Fig. 3. CONVENTIONAL METHOD OF DRAWING GEAR WHEELS.

This consists of a neat *script* letter *f* placed upon the projection of the surface that is to be machined on lathe or planer, say. An example of this is seen in Fig. 2. The finish marks there, indicate that the bar B is to have the ends

machined off smooth, and the blacksmith when cutting the bar should make allowance for the stock that would be turned off in the lathe.

(*To be continued.*)

Oil as Fuel in Axle Manufacture.*

T. C. MCNEAL, FOREMAN BLACKSMITH.

As Chairman of the Committee on Oil as Fuel and its Merits Relative to Coal, Gas or Coke, will say that I have never been in a locality where the gas fuel could be employed as a fuel economically over coal or oil as fuel for furnace work. As to the practicability of oil as fuel in furnace work, such as heating scrap for shingling and forging axles, frames and all kinds of engine axles, and forgings for motion work, I am satisfied from the experience I have had with oil fuel that the iron produced is a much cleaner fibre and more pliable after forging than the iron is that is produced from coal burning furnaces, as the sulphur and injurious elements that are in coal are absolutely foreign in the oil, and that, with the increase of material heated in the oil furnace as against the coal furnace, should, in my opinion, recommend it to any progressive foreman in charge of a forging plant.

I wish to call the attention of the members of our Association to one particular defect in the iron axles forged from coal fuel; that is, the seams that are found. In every axle you pick up to forge any work from, you will find more or less seams. This is not to be found in our axles that are forged here with oil fuel. I am now forging all our supply of 30-ton and 40-ton axles from scrap iron, and also heating for all our bolts and forging machines, as well as the bulldozer, with oil fuel.

As our plant here is a new one, I am not prepared to furnish any data as to the cost per pound of forgings as to fuel, but I am of the opinion that it will average a little better than that of my last year's report, made at San Bernardino, California, with the Santa Fe Railway Company.

To make a perfect locomotive and car axle, free from slag and seams, the spring furnaces, as you will note, are constructed with a double retort, and are very nice, pleasant furnaces to work. The bolt heating furnace, you will readily notice, is a very convenient little furnace for light bolt and forging machine work.

I also furnish print of dies for forging hexagon and square head bolts. These are the pattern of dies employed here in our shops on all our Ajax bolt forging machines, and by which we are able to turn a perfect hexagon or square head in three blows. By the use of these dies we have been able to increase our output over one-third, which means a great saving on cost.

I will be glad to send to any of the members of our Association who are contemplating going into oil burning, a blue print of either of our furnace and burners, on application.

I also send you a print showing the design of our burners for our large furnaces. You will note that the oil flow is central, and the atomizer passes through the outer opening. This is, in my opinion, the best oil-burner I have ever applied on heavy work. I employ steam atomizer on scrap piles, and compressed air on axle piles, as I find that the air will cut the lose scrap where the steam will not. I employ no fan blast whatever, preferring the stack draft altogether.

I wish further to call your attention to the fact that a forging produced from oil fuel will show a slight degree more oxidation than that forged from a coal or gas furnace, and that it is the objective point of many who condemn the oil as fuel and advance the argument that the metal is burned and overheated, etc. I claim that metal that is overheated will not oxidize, as there is no oxygen or hydrogen in the metal after it has been subjected to such treatment, and without those two elements there will not be any oxidation of the material. And I can, as the chairman of this committee, recommend that oil fuel be recommended for all locomotive forgings, as well as for heating small scrap iron, either for rolling or shingling at a hammer.

From an economical point of view, I am inclined to consider oil as having the advantage over coal, when axle welding is to be done. It is very satisfactory in every way. These statememts have come from my own practical observations.

*Report read at the Buffalo Convention of the N. R. M. B. A.

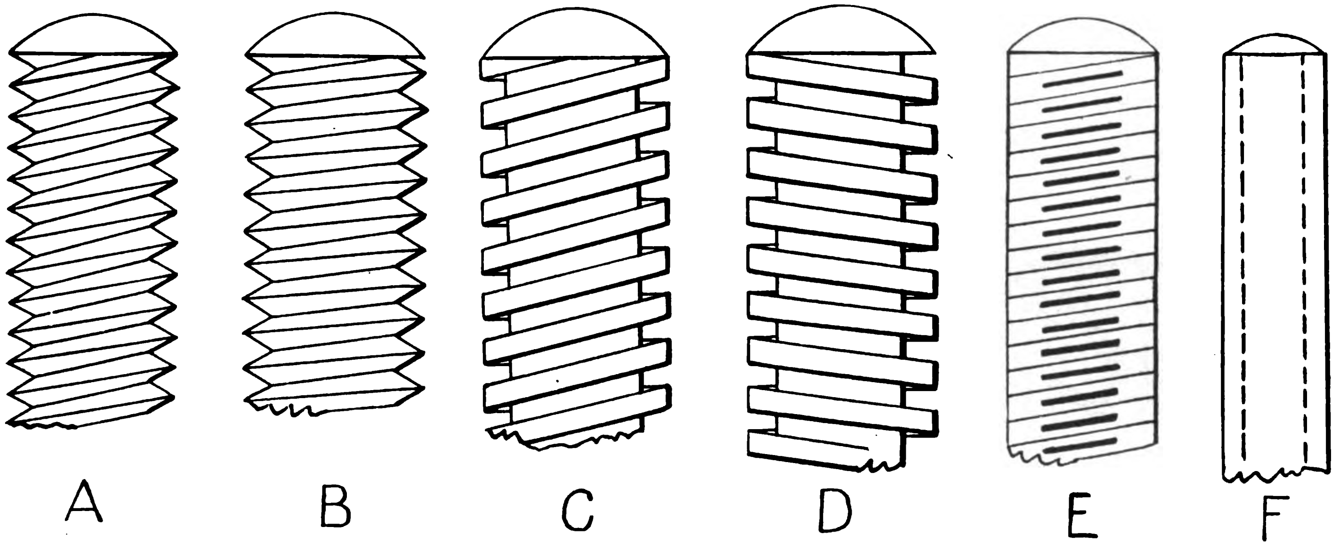


Fig. 4. DIFFERENT FORMS OF CONVENTIONAL SCREWS.

Prices in the Oil and Gas Belt of Southeastern Kansas.

ED. LANDES.

Horseshoeing, per horse (up to No. 5)	$1.50
Resetting " "	.80
Retoeing, extra " "	.20
Plow sharpening	.25
" pointing	.50
New shares: 12″ $3.25, 14″ $3.50, 16″	$4.00
Setting buggy tires, per set of 4	2.00
" wagon " "	1.50
" " " bolted, per set of 4	2.00
New buggy tires furnished and put on,	$4.50 to $5.00
Welding shaft iron	.35
" brace on tongue	.40
" spring leaf	1.00
Setting axles	$1.00 to 1.25
New Stubbs, 1″ with boxes set	6.50
" " 1¼″ " " "	7.00
" " 1½″ " " "	8.00
Setting boxes by machine, 1, 35c., 4,	1.00
Felloes	.20
Spokes	.15
½-in rim. up to and including 1¼-in.	50
Cutting down 4 buggy wheels and tires, set	6.00

An Excerpt.

LONGFELLOW.

Oh! if thy fate with anguish fraught,
Should be to wet the dusty soil
With the hot tears and sweat of toil,—
To struggle with imperious thought
Until the overburdened brain,
Weary with labor, faint with pain,
Like a jarred pendulum retain
Only its motion, not its power,—
Remember in that perilous hour,
When most afflicted and oppressed,
From labor there shall come forth rest.

And if a more auspicious fate
On thy advancing steps await,
Still ever let it be thy pride
To linger by the laborer's side;
With words of sympathy or song
To cheer the dreary march along
Of the great army of the poor,
O'er desert sand, o'er dangerous moor.
Nor to thyself the task shall be
Without reward, for thou shalt learn
The wisdom early to discern
True beauty in utility,

As great Pythagoras of yore,
Standing beside the blacksmith's door
And hearing the hammers as they smote
The anvils with a different note,
Stole from the varying tones, that hung
Vibrant on every iron tongue,
The secret of the sounding wire,
And formed the seven-chorded lyre.

HEATS SPARKS WELDS

A Merry Christmas once more!

The last month of the old year! Ready to make an energetic start with the new?

Daylight wanes, and keeps waning. Does the amount of work increase in spite of this fact?

Thirteen days before Christmas, December 12th, the prize article contest closes. Ten prizes go to the ten best articles on wagon work.

Tricks in all trades there certainly are, and blacksmithing is no exception. Have you worked out any new ones in the course of your daily routine? Pass them on.

Engines, tire setters, power hammers,—new tools and improved equipments,—these are evidences of progressiveness on the part of the smith installing them. Such are the mechanics who get ahead.

Back numbers of THE AMERICAN BLACKSMITH are very different from an American blacksmith who is a back number in his craft. The smith who is not a back number should save all his back numbers.

Harness to match is often wanted by the buyer of a wagon or buggy. The man who deals in wagons can often take up this as a side line, always having on hand or within easy reach a little stock in the harness line. A new source of profit.

The old pump is very aptly taken by a contemporary to illustrate the "keep it going" principle as applied to advertising. As long as you keep it going you are in line for results, but leave off and you must begin all over again. Keep at it.

Don't growl over things you cannot help but bear in mind that there's very little a good man cannot help. Put the shop in order, push your business and keep a cheerful heart. It's a good old world to be in after all, and growling wastes time.

Next month, will be announced the result of our prize contest, and the best articles submitted to us will be printed for the benefit of our readers. Are you among the possible winners? Every sender of an article has a chance. It's not too late up to December 12th. Send it in.

Another big issue of THE AMERICAN BLACKSMITH will be sent out in January—we are preparing one of 50,000 copies that is to be the best we have ever given our readers. Know any friends in the craft who would like a sample copy?—Send us their names and addresses in full.

Appreciation and encouragement go hand in hand. THE AMERICAN BLACKSMITH does not like to take up the space of readers telling what others think about it, but the many appreciative letters received are "mighty" encouraging, and we sometimes cannot forbear printing one or two.

Afraid of tools—That's what some smiths are. Study your tools and get all the use you can out of them. By an ingenious manipulation of his apparatus a plumber mended a typewriting machine. The ingenious blacksmith can do almost anything if he thoroughly understands his tools and is not afraid to try.

Even at this date of advancement the unfortunate horse is not entirely emancipated from the slavery of the horsecar system. In the State of New York, says a contemporary, 115.17 miles of track for this purpose are still in use. California and Kansas also contain a considerable mileage. This seems almost like a relic of barbarism.

Hickory, that most valuable of woods to the wagon builder is said to be in great danger of extinction. The large demand for this wood in making buggies, and the increasing number of these made, have raised the price 100 per cent., and it is expected that there will be still further advance. Steps are being taken to protect this tree.

The thinking man can often add considerably to his income by making over old vehicles. It often happens that a vehicle in its present shape is useless, but it may be converted into a form that will make it, to all intents and purposes, "as good as new." This offers a good opportunity to the energetic smith who is on the lookout for profitable side-lines.

Tell your neighbors. Most of our readers are always ready to tell others about the value of THE AMERICAN BLACKSMITH. That is why such clubs of subscribers as the following are daily coming in: John Maguire, Philadelphia, Geo. A. Hartline, Glenville, Ohio, Ed. Boyle, Aurora, Ill., Sam Lewis, Winnipeg, Manitoba, good sized clubs, every one of them.

A new metal called selium, lighter and stronger than aluminum, has been discovered in Germany by Edward Mollard. It costs only one-twelfth as much as aluminum and will be found very suitable for pipes, ship building and railway building. It polishes like nickel and has greater resistance than iron, but not quite so great as steel. One more new thing.

A telephone that writes the message has been invented by E. Earl Gruhn, Dresden, Germany. The instrument is called a telecrirograph. What an advantage it would be not to have to run to the telephone or to have an operator constantly answering its ring! A business man could simply look at his telecrirograph at leisure, and dispose of all messages at once.

Don't go away with the idea that you can get as good results with cheap paints and varnishes as with the best. At the same time it is well to remember that there is a whole lot of art in laying on either paint or varnish to obtain the best results. The condition of the shop, in respect of air, light and cleanliness will tell on the work as will also the skill of the painter. Buy the best materials, have a suitable shop and study methods and results, and success will follow.

Carborundum is one of the very interesting manufactures of the present day. The carborundum in use has a very different appearance from the unprepared substance that comes from the electric furnace. It consists of a porous mass of hexagonal crystals that give off a rainbow of colors in sunlight. Carborundum is made at Niagara Falls, by an application of the electric power of the Falls. It is a compound of silicon and carbon, of extreme hardness, and is widely used as an abrasive or material for grinding wheels and the like.

Bats and owls like the dark, but human beings do not naturally thrive in gloom. There is something peculiarly depressing about ill-lighted quarters, yet the majority of small smith shops are dark and gloomy and entirely unfitted for human occupation. Besides the direct effect of darkness in straining the eyesight there is another important point to be remembered, which is, that sunlight is necessary to health, and no shop that is not thoroughly filled with sunlight (or sunshine, if possible) can be healthful nor conducive to the best work.

A sorry sight is Tom Tardy's shop since its accident. "Ben havin' quite a time here," Tom called out as we passed a few days ago. Then he pointed to a hole in the roof and a charred portion of wall and floor, and continued:

"It made a bad blaze. I was workin' a bit of iron on the anvil, an' the hot splinters was a-flyin', when I see an old customer o' mine what has gone to neighbor Jenkins with his work, an' still owes me money. So I runs out an' we begins to talk.

"I never thought o' the heap o' wood shavin's near to the fire,—you know my work is pretty close together in there, an' the floor around the anvil is jest plain plank. So first thing I knows, up she comes a-smokin' through the roof.

"O, yes," he concluded, "it'll have to be fixed up before the real cold weather sets in."

We suggested his laying a bit of cement floor around the anvil and forge, or making one of coal-dust mixed with sand and gravel and sprinkled every day with water. Thereupon he remarked, "I've heard tell o' them floors, but—well, it's kinda like lockin' the barn-doors after the horse is stolen."

American Association of Blacksmiths and Horseshoers.

If you desire to help along the movement now under way to secure Lien Laws in the various States for blacksmiths, horseshoers and wagon builders, drop a postal to The American Association, Postoffice Drawer 974, Buffalo, N. Y. The support which will be asked of you is slight, involving no expense, and the benefits at stake are great. Certainly if the blacksmiths of any State desire a Lien Law or any beneficial legislation, it must be they who ask for it from their legislature. The unfailing sympathy and support of the craft is essential to the success of any measures taken to secure the benefits mentioned. The time is fast ripening for action. Are you ready to lend your personal backing to the extent of a small effort? If so communicate with THE AMERICAN ASSOCIATION, under whose guidance the present movement is being put forth.

For the benefit of many late readers, the following brief outline of the nature and purposes of a blacksmith's Lien Law is given: The idea is to secure the passage of a bill through the legislature of each State, or as many as possible, putting a new law on the Statute books, or else amending existing laws relating to liens, so that a blacksmith, horseshoer, or wheelwright can secure the payment of his bills by means of a lien filed upon the horse or vehicle upon which he has worked. We will suppose, for instance, that a smith has shod a horse for a period of six months without receiving any pay. The account may drag along three or five months after that, no attention being paid to frequent statements of the account or requests for settlement. The smith may then file a notice of lien upon the horse, covering his charges for shoeing it, for a year or more back, according to the terms of the law.

If the moral effect of this does not suffice to bring the delinquent to time, he can, by an action under the lien, have any just claim settled, even going so far as to force the sale of the animal to satisfy his claim. Other craftsmen have their lien laws—why not the smith? Laws permitting the horse or vehicle to be held in the shop until payment is made are of little practical value compared to the one outlined above. Your support is desired. Will you give it?

We wish to present to the craft this month one little word for their individual consideration. It is "unity." Are not the interests of neighbor blacksmiths alike, and is not jealousy the greatest stumbling block in his progress towards better things? Unity is a great force. With unity, a band of neighbor blacksmiths can accomplish wonders—without it, little or nothing. Unity is the secret of successful co-operation and organization for the advancement of prices and the betterment of craft conditions. Is there unity in your neighborhood?

We should like to hear from different sections upon this topic. Our plans for the formation of local county associations may be had upon request, and many craftsmen in various States are availing themselves of these plans to secure a better living for themselves.

Now is the time to concentrate your efforts towards organization—now when the new year is opening out before you. Talk the matter over with your neighbors, and see what you can do towards effecting an organization in your locality. Explain to your neighbors the advantages to be derived from unity. A thorough understanding of his own position is all that most smiths need to be convinced of the benefits at stake.

Steel and How to Treat It.—7.

JOSEPH V. WOODWORTH.

The Hardening Heat.

While all mechanics who have worked and tempered steel through any length of time have usually secured good results, the majority experience difficulty in deciding exactly the proper heats for hardening different kinds of steel to be used for different purposes.

First, let it be understood that the effect of heat on steel is to expand it—even or uneven expansion depending upon the care and thoroughness of the heating operation. Thus, if one part of a piece is heated quicker or higher than another the expansion is uneven, and the shape of the part changes to accommodate the local expansion. The consequence is that distortion takes place and remains permanent. In machine parts which have been finished and fitted, or in any part which it is not practicable to grind afterward, the distortion often prevents the use of the piece; especially is this so in intricately-formed tools.

The matter of deciding upon the proper hardening heat for different tempers of steel is a most important one. The ability to do this correctly is one to be prized, and comes through knowledge, observation and experience and, although each temper of steel necessitates a different degree of heat to harden it perfectly, an expert operator strikes it nine times out of ten. However, what of those who are not expert operators? They are the ones I wish to reach.

In the first place there are too many steel workers who consider any steel that will harden as good steel. Some may think that when the steel operated upon is of a uniform grade, the same degree of heat will always bring forth uniform results. But this is a mistake, because steel decarbonizes according to how it is heated and where; a small piece deteriorating by being heated in the open fire, a large piece from "soaking" too long, and a piece often heated for repairing or sharpening suffers in proportion. Hence the hardening and tempering processes of steel must necessarily differ according to the "carbon percentage," of the steel, the nature of it, the amount of uniformity required, and the results which the tools or parts are to accomplish.

The capacity of all steel to cut, punch, withstand pressure and concussion lies principally in its temper, while its durability depends entirely on its quality, and its adaptability to the kind of work for which it is to be used. Thus, to secure the best results from hardened tools steel of the proper grade must be used. In the heating of steel for hardening, the proper heat is generally determined by the eye of the operator. The only other way to ascertain it is by means of a pyrometer. However, even in the use of the pyrometer, skill plays prominent parts, as the size of the article and its carbon percentage have considerable to do in determining the heat that must be given it to harden it properly. The proper hardening of steel is a matter of good judgment combined with experience, not of hard, hide-bound rules! It is not possible to tell in a few words how to determine the correct heat for any given temper, size or grade of steel.

We have now got back to the question, "How shall the steel worker know positively and accurately when his steel has reached the proper heat?" The answer is, "By means of a properly constructed furnace, and a pyrometer with which to measure the temperature." Of course, in all open fire heating the eye of the operator is relied upon to determine the proper heat. But the open fire method is becoming obsolete, and is gradually giving place to the furnace, while the use of the pyrometer is becoming extended, so much so, in fact, that over 800 of the most famous type are in use to-day in the United States alone. This fact alone indicates that

hardening and tempering have become a science, and that the time is not far distant when experienced operators will be capable of eliminating all risks and losses.

The work of hardening and tempering of tools should be given to one man. The effect of previous annealing on steel that is to be hardened must be understood. The successful hardening of an intricate tool depends upon how the previous annealing was done, and it is that process which removes all strains sustained in rolling, hammering and forging. The manner in which the steel enters the quenching bath will determine whether the tool will come through the process hard, and free from cracks and deformities. Large pieces with deep recesses will have to go into the water with the recessed part first, or vise versa, according to the shape and location of the same; large pieces which are worked out in the center will require a stream of water striking against them. With some grades of steel the best results will be attained by removing them from the bath as soon as they cease verberating, lastly, experience, skill and good, sound, practical judgment are absolutely necessary. I recommend three grades of steel for different purposes: For planer, lathe, slotter, screw cutting tools, and hobs and dies, etc., use the high-grade of "Crucible, or carbon steel," for hammers, chipping chisels, etc., and all tools required to stand shock or concussion use the second grade; while for sets, hot punches, fullers, etc., use the third grade.

Now how are we to get the best results from these different grades of steel, with the different treatments? First—after having selected a good steel for the purpose for which the tool is intended, a good furnace is necessary, and if one is not at hand, a good, clean fire with a deep, well packed fuel body, which will prevent the air blast from striking the steel. We now heat slowly and thoroughly, turning the steel frequently. When the steel is heated no higher than is necessary to get the desired degree of hardness, we remove and quench in the cooling bath. For planer and lathe tools, etc., do not draw the temper after hardening, as a little practice with heating and quenching will teach one how to quench at the proper heat. It would not instruct the novice for me to say "heat to a red, a full red, a cherry red, or a dull red," it would be too indefinite. The man before the furnace or the one behind the anvil *knows what* these heats are; he also knows that the successful toolsmith is an artist, and that any tool from his hands represents a triumph in science and mechanical art. The steel worker whose eye is not trained must harden by science. I will discuss both methods.

Let us say that we have a large die, or punch, to harden, and we are going to do it by sight. After heating the tool until the eye tells us that the proper heat is reached, we carefully remove it and lower it into the quenching bath. We have taken lots of time in the heating of the large tool, probably a couple of hours so as to allow the grain or particles of steel to prepare for the wondrous change that is about to take place. As the tool is gradually lowered into the bath, the water boils with the intense heat. When the water becomes calm, we remove the tool and find it just right. We have done a good job, but can we feel certain that the same method can be relied upon the next time? No! We have been hardening by sight.

Now we will harden scientifically. First we secure a good grade of steel, and gain a knowledge of its contents by experience and testing. Then we secure a good steel heating furnace, that will heat slowly and maintain an even degree of heat; a furnace equipped with a pyrometer to register the degree of heat. We raise and hold the heat at the proper degree until the steel is heated through. Then we immerse the tool in the bath and the job is done. With this last method there is no guess work and no necessity for artistic ability. With the first method the eye may be deceived as to the right heat, but with the latter, natural laws that are absolute, govern the results, and uniform results are guaranteed. With this method of hardening, there is no drawing of temper—none is necessary. This twentieth-century method of steel treatment eliminates all possibilities of error and loss, and guarantees the efficiency of the product.

In my next chapter I will discuss the all too prevalent habit of overheating and uneven heating for hardening, and the effects of the same.

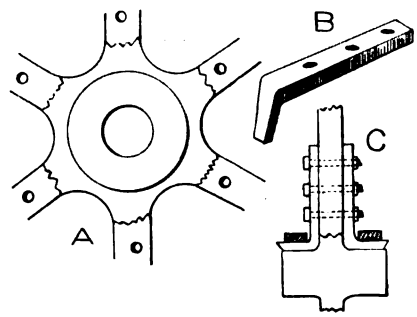
(To be continued.)

Mending a Driving Pulley

F. L. MORGAN.

The accompanying sketch is of a driving pulley from a 40-horsepower engine broken last winter, and the following is the way I patched it.

All the spokes broke at the hub, as shown at A. I made two pieces, as shown at B, and bolted them on the foot, ran out over the hub and ⅛ off, as shown at C. When I got them all on, I made two rings, 1½ inches square, (seen in section at C,) drove on hot, and let them shrink on the feet and drew the spokes down tight. This engine has run away twice since and never broke, so the job was a good, strong one.



INGENIOUS PROCESS OF MENDING A BROKEN ENGINE PULLEY.

A Few Good Shoeing Shop Suggestions.

A. M. MEISNER.

A few rules for shoeing that have been drawn from daily experience and observation in my shop may be of interest to the craft.

First: Save the heel as much as possible.

Second: Save all the frog.

Third: Cut nothing except what is loose on the sole of the foot.

Fourth: Do not cut out the braces.

Fifth: Beware of opening the heels.

Sixth: Fit the shoe level all round the foot, and be sure that the bearing is on the heels and not on the quarters.

I do not believe in cutting out extremely for toe clips—not more than the thickness of a thin clip on a healthy foot. In some cases I cut nothing at all. Often I have been compelled to let the shoe project a quarter of an inch over the toe. The shoes must be fitted full to the foot for the purpose of saving the wall, as that is the strongest part of the foot and should not be chopped or rasped off.

I also find that most of the ordinary shoes are not properly punched. The nail holes are too near the outer edge. When such a shoe is put on the foot and the outside of the hoof rasped off even with the shoe there is but little left, and will break out sooner or later. By punching the holes properly, the nails do not have to be driven so high, and the foot outside will remain solid.

We all know that the colt was born with level feet without calks and heels, and in my estimation they should be kept that way as nearly as possible.

A horse with level bearing shoes will

not be subject to corns or difficulties, and his feet will remain in good condition for service. Contracted feet, I believe, are caused by high heels and calks with poor fitting. Sometimes the shoes are extremely concave, clear out to the end of the heel. At other times the bearing

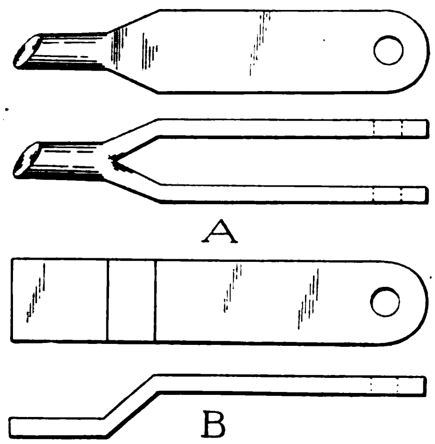


Fig. 54. MAKING A BRAKE-ROD JAW FOR LIGHT LOCOMOTIVES.

is on the quarters instead of on the heels which will naturally help to contract the feet. This can be overcome by properly made and fitted bar-shoes. It can also be done with plain, open shoes without heels and calks by having the heel ends about $1\frac{1}{4}$ inch in length, concaved towards the outside. Fit the shoe so that the heel ends come close up to the frog, but the feet must be kept soft to reach these results.

It can also be done by applying three-quarter light slippers on the toes; and allowing the horse to walk on the frog is also a good remedy.

If any of my rules or suggestions should be found of benefit to any of THE AMERICAN BLACKSMITH readers, I shall be glad to feel that I have done something for man's best friend—the horse.

The Country Smith.

BY EXPERIENCE.

Times are constantly changing and with them the country blacksmith is whirled along, or if he refuses to move, is left behind. The old way of having a small shop located at some cross road for the convenience of a few farmers is a thing of the past, and the shops are now clustered in the confines of a thriving village, where the farmers go to mill, to the stores, or to market, and where there is good hotel accommodation for themselves as well as their horses. While they are getting their wants attended to, they take their horses to the blacksmith to be shod, as well as some other things that need repairing, and in this way several blacksmith shops are kept busy in the same neighborhood.

Now it is a question between the disciples of Vulcan which is getting the most patronage. One may have the lead in horseshoeing, another in building and repairing vehicles, while the third will excel in the repairing of machinery, etc. At the present time the farmer is very particular to have whatever work he entrusts to any one of the above mechanics done in a neat and workmanlike manner and for that reason, more care should be exercised by the craft in finishing their work. No matter how well a horse is shod, if the foot is not neatly dressed and polished, the farmer will not be pleased with the shoer. The same is true of the repairer of vehicles. If his work is not neatly done, no matter how good it may otherwise be, it will not satisfy, and he will soon be known as a rough mechanic. Also a man who has taken the repairing of machinery as his chief calling—whatever he undertakes to do must look well when finished.

This being the case, it devolves upon the craft to cater to that taste of the customer, and when one has once acquired the habit of making his work look neat, it won't take him any longer to do it than it would to do it in a rough manner, and he, himself, will take more pride in his work and gain a reputation that will enable him to get better prices for the work. Say for instance, a part of the castings of a farming implement has broken. It can be mended and made to stand the strain as good as new, but it must be done without looking clumsy, or disfiguring the implement if the customer is to be pleased enough to stand the price asked without grumbling. It is therefore necessary that first he learn what is wanted by the customer, and next, the way in which the work can be done to be a success. In that, the suggestions of the customer may often prove of much value. It is also necessary to have the tools and materials at hand to carry out whatever plan is adopted, and, lastly, to do it in a neat, as well as substantial manner.

A free use of rasps, files, sandpaper and a little paint will go a long way to make work look pleasing not only to the customer, but also to the mechanic himself. Therefore, no matter what kind of work you are doing, finish it neatly and it will soon establish for you a reputation that defies competition, and you will always be fully engaged.

The blacksmith who intends to make a success of his trade will do well to pay attention to these seemingly unimportant points. To the business-like man, pleasing a customer becomes a matter of policy. A neat job is sure to bring more trade, while a careless one drives people elsewhere.

The Railroad Blacksmith Shop.—14.

W. B. REID.

Tools in the Blacksmith Shop.

The accompanying illustrations show some of the tools that may be made to simplify work in the forge shop. Fig. 54, A, shows an ordinary brake-rod jaw used on light locomotives, freight cars, etc. Making these in quantities, the tool in Fig. 55, A and B, will prove a great help and time-saver. It is made of mild steel with planed, hardened cutting surfaces. The drawing will make its construction clear.

The cutting and forming plates Fig. 55, A and B, are rivetted in place. This simplifies construction and answers the purpose as well as if made in the solid. This tool shears the ends round, puts in offset and, if desired, punches holes in pieces used in making the jaws, in one heat. The iron used is $2\frac{1}{2}''$ x $\frac{1}{2}$, $\frac{5}{8}''$ or $\frac{3}{4}''$. Cut in lengths of 11 inches, the pieces are laid along the recess in the tool, extending slightly beyond the round end. The plate shown at A, Fig. 55, is then adjusted upon the top of the die at B, Fig. 55. A light blow of the hammer shears the ends.

Removing the cutting, a second blow of the hammer drives the piece down

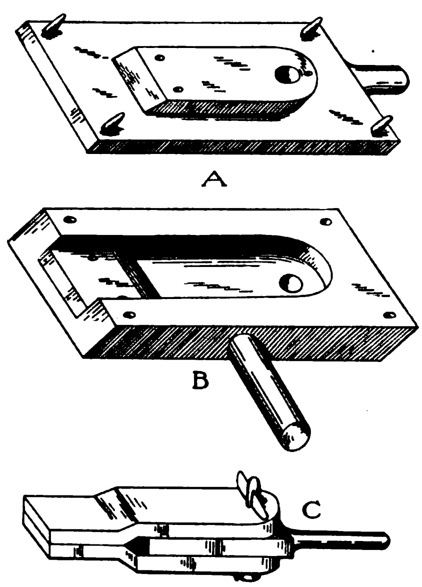


Fig. 55. TOOLS FOR SIMPLIFYING CONSTRUCTION OF BRAKE-ROD JAWS.

into the recess of the tool, forming the offset. The punch is then inserted and driven through, completing the pieces with uniform accuracy for welding as shown in Fig. 54, at B. In welding the jaws, light flat mandrels, used as shown at C, Fig. 55, keep the holes true and make easy handling of the piece.

The dowell pins in this and the other tools here described are somewhat longer than usual, to overcome the thickness of rivetted cutting plates. Kept well oiled,

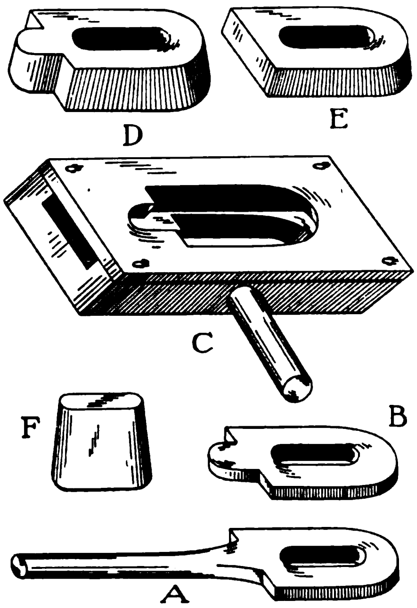


Fig. 56. PUNCHING PLATES USED IN MAKING CAR DOOR STOPS. A. B.—FINISHING UP THE PIECE.

however, and handled properly, the tools work smoothly and will last indefinitely.

An occasional order of several hundred car door stops, (Fig, 56, A), is easily and cheaply overcome by means of the punching tool shown in Fig. 56, C. The drawing will give a clear idea of its construction. The cutting parts are made of old steel axles. The guide plate, it will be noticed, is rivetted permanently to cutting die. The iron 2½" x ½" is slipped in from the end, beneath the guide plate. The punch (see D, Fig. 56), is then driven through, driving the stamped piece down upon the washer at E. This washer fits into the bottom of the tool to form the shear for the thin, oblong punch at F, for which the hole in the punch at D forms the guide. The pieces then drop out from the bottom having been thus stamped out, as shown at B, clean cut and uniform. The welding of 7 inches of ½-inch rod upon the end completes the job. The forging might be stamped out with sufficient stock on the end to draw out the stem full length. It is better and quicker to weld. This can be done at the anvil, removing the pressure at the hammer, a point of some importance in shops where hammers are limited in number and capacity.

Fig. 57, at A, B, and C, shows tools for making knuckle joint pin nuts as at D. Method: A piece of mild steel is drawn out to hexagon shape to fit in the hole of the die C. This is cut into short lengths with sufficient stock projecting above the surface of the die to form the collar. A few blows of the hammer will suffice for this. The piece is then reheated and placed in the tool at A, Fig. 57, the hexagonal hole of which catches the point of the nut and keeps the collar central with the cutting radius of the tool. The cutting plate at B, is then adjusted upon the top, shearing the collar neatly and accurately with a few blows of the hammer. The holes in the center of the nut are more properly machined, but, if desired, they can be punched in the tool by having a hole through the centre of the cutting plate (B, Fig. 57,) and a small washer, with similiar hole, to fit in the bottom of the tool A, and a round punch to suit.

Having to shear mild steel, this and the next tool described could with advantage have cast steel cutting surfaces. But when well hardened with potash and kept cool when in use, mild steel will be found to give good service.

Fig. 58, A, B, and D, shows the parts of the tool for cutting out cross-head pin nuts and crank pin nuts. These nuts are made of mild steel. In tools of this kind the guide plates are generally rivetted to die as in Figs. 56 and 59. When so made they can only be used for stamping out the nuts. As arranged in Fig. 58, B, the guide plate is removable, allowing the tool to be used for punching a hole in a closed hexagonal wrench, occasionally required (Fig. 58, C).

The dowell pins, as shown in Fig. 58, B, are turned with small collars upon them, which keep the guide plate at suitable distance apart from the die, and hold the wrench C in proper position while being punched. If necessary, the holes in the centre of these nuts can be punched by the same means described in Fig. 57.

Fig. 59, A and B, is a tool of similar design to that shown in Fig. 55, for shearing the ends and punching the key holes in spring hangers. Fig. 59, C, shows a tool for the same purpose of a more complicated kind which we have seen used. The first answers the purpose equally well and is more easily made.

(To be continued.)

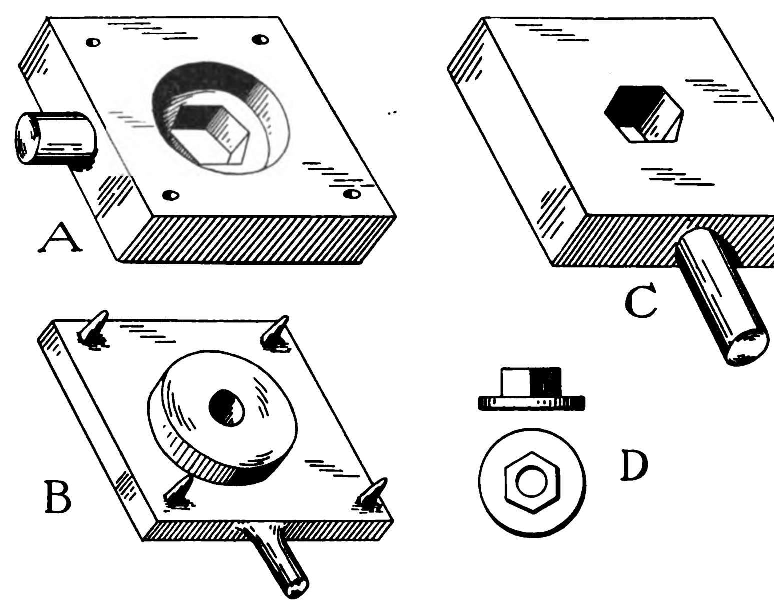


Fig. 57. TOOLS FOR MAKING KNUCKLE JOINT PIN NUTS. D.—THE FINISHED NUT.

A Property of Radium.

Much is being said just now about the wonderful new material, radium. A surprising fact in connection with this material is that its property of giving off heat is augmented by subjecting it to low temperatures. At the temperature necessary to liquify hydrogen gas (and this is the lowest yet attained by scientists) the heat given off from radium, instead of being diminished is increased. This is directly opposed to the effect produced by low temperature upon ordinary chemical action.

Neatness vs. Roughness.

BY PLAIN TALK.

There is a very great difference which I have often observed in blacksmiths, which is merely a habit, but which is of much importance to the repairman, and that is, the rough or smooth appearance of a completed job. Now it is natural and pleasing that in anything we buy we like it neat, and manufactures of all kinds will be slow in selling if not neatly finished or at least neatly and attractively done up in some casing. Why is that so? Because if not done up or finished, it fails to please the eye and an inferior article often finds more customers

than one of better merit, simply because it looks well. Now with that fact in mind, I would say a few words to those who, like myself, have various jobs to do, and for which we would like to have a fair remuneration for doing, but are afraid that the customer will think the price too high. Now that customer will cheerfully pay for the job if he is pleased, not alone because it is a good strong job, but more so because it is neatly done and he will not hesitate to say so. Now, what I am particularly referring to is forging. There are some smiths who will turn out a forged piece of work that resembles the cinders on his forge very much, and although it looks strong, it is extremely rough and looks anything but pleasing to the eye, a fact that the customer will notice at once and go away with it in full belief that it is burned. Now that man would be delighted if the smith had only exerted a few extra blows in smoothing and finishing that job and he himself as well as the customer would be better satisfied. The smith who does not smoot hhis work either with hammer, file, or otherwise will soon establish for himself the name of a rough workman, and very few men will care to entrust any work to his charge that is of any value. Now why cannot the work be done so that it is more pleasing? Is it because it takes up more time? I say no, for it's as I said before, only a habit, and where that habit is of long standing it is difficult to change. But it can be done by a little perseverance and it will then take no longer to do work neatly than rough and will be more satisfactory to both the smith and the customer, and the latter will be much less likely to grumble at the price. A little care in forging, a little filing, and a little paint, will go a long way to please. Therefore let me advise the young beginner to finish all his work so that it pleases himself and when he has once got into that habit, he cannot quit a piece of work until it also looks well in his eyes and make this his maxim, that whatever is worth doing is worth doing well, and I might add, doing neatly.

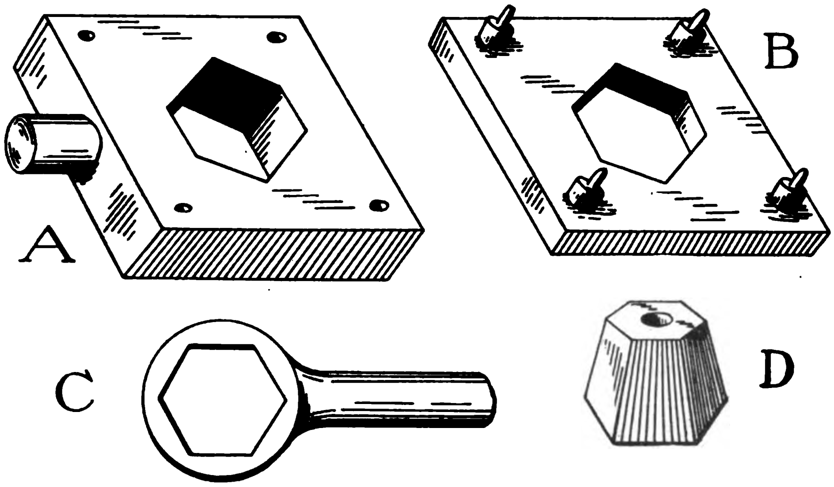


Fig. 58. PARTS OF TOOL USED IN CUTTING OUT CROSSHEAD PIN NUTS AND CRANK PIN NUTS. C.—PUNCHING A HOLE IN A CLOSED HEXAGONAL WRENCH.

A Very Interesting Bit of Shop Talk.

J. W. LARSEN.

I am glad to see that there is more interest taken in the blacksmith's art every year. When I started to learn the trade I never heard of such a thing as a journal devoted to the trade, and very seldom could I get an article of experience from any paper.

I learned my trade in Chicago, and when I had served my time, I thought I "knew it all," as the saying goes. There had been rules laid down for me for everything, and I was told that was the only way to do it. When I started out to earn my living I kept true to the old methods, but that was where I was wrong. That is why the blacksmith's art —the oldest art in existence—has almost been pushed to the wall by the other arts that have sprung from it.

The art of horseshoeing was known among the Arabs as early as the time of Mohammed, so history tells us. By tracing it carefully you can follow it from generation to generation, but we have been letting parts of it slip away from us from time to time.

In ancient times, whenever you wanted a sword, a scythe, or an ax, you went to the blacksmith for it, but to-day we are left to repair the work of the arts that have sprung from us. Now-a-days, most of our material comes ready-made from the mills—shaftings and bars instead of being hammered out and finished in swedges are rolled and then turned over to the machinist to turn on a lathe or square on a planer.

The machinist to-day is a very good mechanic. He can turn out a fine piece of work, but, if in turning the shafting should he find a flaw, can he repair it? No. What does he do but send it to the blacksmith and have it welded. He does not think it much of a trick, but if every blacksmith should take a lay-off for a year, where would all our great industries be? What would our railroads, manufacturing plants or mines do? If they could not get their picks sharpened and rods welded, they could not run a day.

It is true, a blacksmith does not have the chance to learn easily as other classes of mechanics, for where is the man that can lay down a rule for welding? The principal part of the work, the color or heat of iron or steel depends upon the kind or quality, if it is high in carbon or no carbon, and it also depends upon your fire and the kind of coal you use. But let a blacksmith learn by actual experience what heat iron and steel will stand. If he is a mechanic and has a good brain, he can learn the construction of any kind of a machine or vehicle by rules and explanation of others, and the trade journals of to-day can teach such men more than they could ever learn in any one shop in the United States.

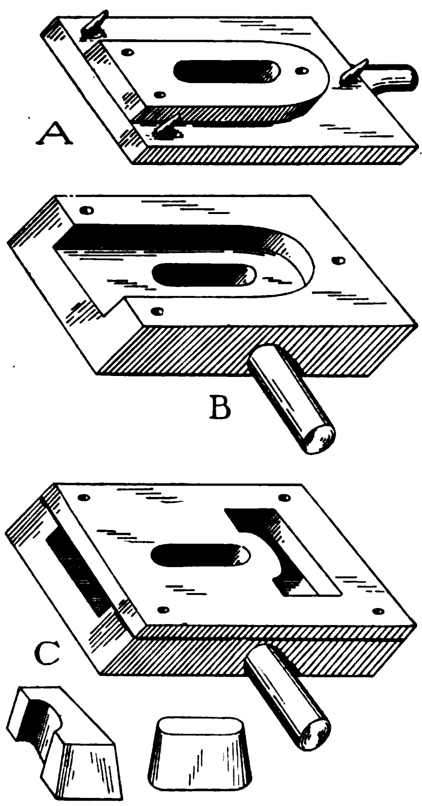


Fig. 59. TOOLS FOR SHEARING THE ENDS AND PUNCHING KEYHOLES IN SPRING HANGERS.

What we want now is to educate ourselves up to what we have lost by giving our brother smiths the advantage of our experience and for him to do the same, for there is never a shop I have gone into but that I have found some handier if not a better way of doing things than my own.

It is evident that we must have power in our shop or we will soon lose tire-setting. The machine shop can put in a cold tire-setting machine and set tires cheaper and better than we can by the old way of cutting and welding or even by heating and upsetting. They can give the exact amount of dish, while it is almost impossible for us to get it to a sixteenth of an inch, and if we want to compete with them we must wake up.

As the making of tools has been taken away from us by the process of casting steel, it remains for us to improve our methods to keep up with the times or else we will soon be looked upon as tinkerers, and finally be lost sight of.

I like to see the laws they are passing in some States requiring a man to stand an examination before he can shoe horses. They should go a little further

Fig. 1. BROAD CHESTED ANIMAL, SHOWING THE BASE-WIDE POSITION.

and require a man to stand an examination for his ability in welding. Many accidents can be traced to a poor weld which is the cause of death or crippling of human beings or animals.

I have been in shops in the Northwest, where men were doing a big business, probably three fires and four or five helpers, and they did not have a labor-saving tool in the shop. They were in such a hurry to get a thing done that they did not have time to take a good look at it when it was finished, to see if it was perfectly welded.

Much poor work was turned out there, but the people seemed to expect to have to come back to the shop with a plow that would not work or a shaft iron that did not stick, and when it broke, it probably upset the buggy or caused a runaway.

There must be more care taken in our work and we must learn better methods and the only way for us to do it is through the columns of the trade journal.

The Practical Scientific Treatment of Interfering Horses.—1.

E. W. PERRIN.

General Principles.

There has been so much written about interfering, that to the casual observer it would seem like threshing old straw to write more on this much-hackneyed phase of the subject. However, this is one branch that is never exhausted. It is a topic always new, because it presents itself to the horseshoer in his every day practice in a thousand different forms. It is a subject never absolutely mastered because new cases present individual peculiarities which often have the shoer at his wits end. Hence, we often meet men who have spent their lives at the anvil, and who have stopped numerous horses from interfering in their day, yet they occasionally meet with cases which baffle all attempts to rectify the trouble, and the truth of this is amply proven by the numerous inquiries to this Journal as to the proper way to shoe interfering horses. Hence another series of articles on the subject of interfering will doubtless be of interest to the numerous readers of THE AMERICAN BLACKSMITH. Interfering embraces any and all irregularities of gait or action which result in the striking of one limb with the opposite foot, or the striking of the front legs or feet with the hind feet, or vice versa. But as the different forms of interfering require different treatment, the subject will be dealt with in a series of nine articles as follows: —knee knocking; shin hitting; ankle or fetlock striking, front; fetlock striking hind; cross firing; forging; over-reaching; speedy cutting and scalping.

Knee Knocking.

Knee knocking, as its name implies, consists in the animals striking one knee or both with the opposite foot. Usually only the foot is affected and often the pain caused by the blow is so acute as to cause the animal to fall.

Fig. 2. A NARROW-CHESTED HORSE IN THE BASE-NARROW POSITION.

Cause:—The cause of knee knocking is invariably defective conformation of the limbs, unbalanced feet, or both. The knee knocker is usually a high actor, (high stepper), he may be broad chested and "toe wide" with legs wide apart (Fig. No. 1), or narrow chested with legs close together (Fig. No. 2). With this class of horses if the feet are large and the action high, the feet must pass dangerously close to the opposite leg, in which case indifferent shoeing, or even careless driving would make such an animal into a knee knocker. Your patient may have one leg twisted from the elbow down, or from the knee (a twisted cannon). Sometimes one pastern only is twisted in or out, occasionally one leg is calf kneed, while its fellow is toe wide; these defects in conformation of the limbs cause irregularities in their gait and action—sometimes a mechanical impediment to the true and clear movements of the limbs. To balance action, then how to shoe for knee knocking will depend upon the cause, and this is wherein the difficulty lies, for remember it does not take a limb that is a foot out of plumb to make a horse interfere. These defects in conformation of which I speak may be very slight and yet sufficient to cause interfering.

To the causual observer all horses' legs look alike; it takes a keen, accurate observer with a true eye to detect defective conformation, but if the horse interferes, the defect, be it ever so small, is there, for the horse of perfect conformation does not interfere unless he is out of condition, carelessly driven or ridden, or badly shod. Hence the first thing to do is to endeavor to ascertain

the cause. With this object in view, get all the information you can as to the history of the case from the owner or driver, and a reply to the following questions will materially assist the shoer in ascertaining the cause: One. How long have you known the horse? Two. Is he in the habit of interfering or is this the first time you have known him to interfere? Three. Is he a green colt or a matured horse? Four. Is he accustomed to the work for which he is now being used? Five. Did he go clear before he was last shod? Six. Is he thin and poor or in good working condition? The object of these questions is: Question No. 1,—If a man has only just purchased a horse that interferes he may not be able to give you any information of any value. Question No. 2,—If the horse is in the habit of interfering, you may look for defective conformation of the limbs. Question No. 3,—If he is a green colt and apparently properly shod, then don't experiment with his feet, unless you are certain of the cause, for many a green colt will interfere anyway, until he settles down to his work and learns how to handle himself; in this case protect the part struck with a properly fitting boot until the animal is thoroughly broken in—trained to his job,—then if he still strikes the boot it is time enough to look to the shoeing. Question No. 4,—If a horse travels close—is prone to interfere—it takes but little to make him strike; some horses that go clear single, will interfere when hitched double, especially if not properly mated; some horses not used to saddle work will interfere when ridden, and vice versa. Question No. 5,—If the horse travelled clear before the last shoeing, it is very probable that the shoeing is the cause—that the work was not properly done at that shoeing. However, this is not always the case. Question No. 6—If a horse that is prone to interfere, be thin and poor—in which condition he is not fit for work—there is but little hope of preventing the trouble until the animal is in proper working condition. Again some people try to make one horse do the work of two. In such cases many a horse interferes as a result of leg weariness; all horse shoers have observed that many horses interfere in the hot weather that go clear in winter.

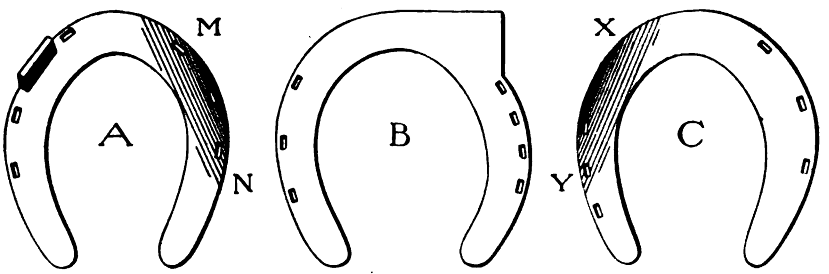


Fig. 4. GOOD FORMS OF SHOES FOR DIFFERENT CASES OF INTERFERING.

So let it be understood that all these points must be taken into consideration in order that you may arrive at correct conclusions, for the main point is to discover the cause, the application of the remedy is merely a question of mechanical skill. And these inquiries will hold good in the discovery of causes in all the subsequent articles of this series. Then having made up your mind as to the cause of the trouble, and assuming the cause to be defective conformation of the limbs, one leg or both, then that defect must be carefully studied, and here a careful study of nature's plan is a sure guide, for although nature makes a crooked limb, a twisted bone, or joint, she makes the foot in conformity with the limb. But some unscientific horse shoers try to make a straight foot work in unison with a crooked limb.

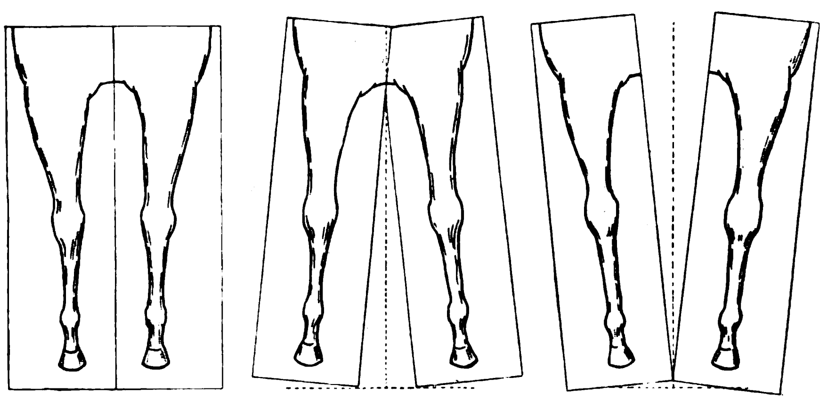


Fig. 3. PRACTICAL ILLUSTRATION OF DIFFERENT POSITIONS OF THE FORE FEET OF A HORSE. NORMAL POSITION. BASE-WIDE POSITION. BASE-NARROW POSITION.

To illustrate what I mean, I will introduce to your notice the following diagram:—Take two 9-inch envelopes and draw on them a rough outline of two forelegs, then stand them on end, (Fig. 3), thus illustrating the normal position of the fore-legs, now tilt the envelopes towards each other at the top, showing the base-wide position (Fig. 3), and you'll see at once that to level these feet, you must lower the inside or raise the outside of the foot; now tilt the envelope outwards at the top, showing the base-narrow position (Fig. 3), and you see at once that in order to level these feet, the inside must be raised or the outsides lowered. In other words the hoofs are level only when pared in conformity with the limb to which they belong. Then the matter of first importance is to level the feet; if the animal strikes the knee, the leg with which he strikes will probably toe out, while its fellow may be normal, in which case only one foot will need treatment; all knee knockers should be shod as light as is compatible with the work for which they are used. On the foot with which he strikes, use the shoe shown in Fig. 4, at A, with the outside quarter rolled. If the foot with which he strikes is base-wide or calf kneed, then leave the inside of the foot low and use the shoe shown at B, Fig. 4. If your horse has both legs toe wide and strikes both knees, then use an inside weight with the outside toe rolled as at C, Fig. 4. The Charlier system of shoeing is excellent for some knee knockers whose feet are strong enough to stand close contact with the ground. All such cases should be protected with a properly fitting boot until you are sure that the trouble is remedied.

The individual horse to be shod must always be studied, for what answers as a good remedy in one case, may only make matters worse in another. Where the fault has become chronic, great perseverance will be necessary to render even the best shoeing-principles effective. Thus it is better that the same farrier should shoe a horse rather than that different horseshoers should work on him. The owner of the horse should be made to appreciate this fact.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Corns and Their Treatment.—I should like to hear from some one as to what he consider the best treatment for corns on the horse's foot. J. S. JENNINGS.

A Good Word.–Locality Enquiry.—I like THE AMERICAN BLACKSMITH very much and should like to see it prosper.

Does anybody know of any good shop location in Illinois, Missouri or Iowa, back from the river bottoms? I should like to make a change from present location on that account. F. L. MORGAN.

A Few Questions on Steel.—I should like to have some one answer the following questions: What steel is most suitable for rivet snaps or cups as used with pneumatic hammers or boiler work, say ¾-inch rivets? Is there any special method of tempering these tools? JAS. BATTLEY.

Rubber Stamps.—Names and addresses written hurriedly on letters are in most cases not nearly so legible as they should be, so that a rubber stamp is a great aid towards a clear, readable signature at all times. The man who runs a shop finds much use for something of this kind.

Why Is It?—I have a question I should like answered. I use a lead pot to harden in, a piece of 4-inch gas pipe plugged at one end, and lay it on the fire at an angle of 45 degrees. When work is dipped in the bath it seems to have a thin skin on the outside and wil not harden. It is not the fault of the steel, because the same piece will harden all right in the open fire. Why is it? J. F.

Hack Saws.—I will give a pointer on how to use a hack saw. A great many smiths take a saw and saw until the same heats, and thus ruin it in a few minutes. If they would but dip their fingers in the water and rub on the saw blade every little while, they would find that it will last three times as long, and will cut three times faster. Try it. H. STADE.

Is This Correct?—One of the largest industrial shops of Harrisburg, Pa., writes regarding blacksmithing papers, "We agree with you that it is a good thing for the men to read mechanical papers. In our machine shop and foundry they appreciate such things very much, but it is hard to get the blacksmiths interested." Is this a correct statement, and are blacksmiths less interested in literature pertaining to their craft than machinists, molders, and other mechanics? We do not believe this to be so, and should like to hear from any of our readers on this topic. [EDITOR.]

An Interesting Letter from Canada. I should like to see in your valuable paper a series of articles on the management and running of gasoline engines, or could you refer to any publication on the subject?

I think your paper a very estimable friend, coming every month with new ideas, points and latest methods in vogue, which should be of great interest to all good working smiths. And certainly it gives the vim and relish to our work, by bringing us in touch with what others are doing, thus to bring our work to the best standard possible. Wishing your paper success in every particular, I am, E. J. COVINGTON.

Case Hardening Links.—In answer to the question of Mr. Frost relative to case-hardened motion links convexing, I will say I have had no experience with links convexing across the face. We have in the machine shop five sets of new links with faces three inches in width, just case-hardened for five new engines we are building. I have tried straight edge across the face of all of them, and they are as true as when machined. I am at a loss to know the cause or remedy for such trouble. Am pleased, however, to know Mr. Frost is looking the matter up. We often hear of "cause and effect" and when the effect alone is in evidence we should try to determine the cause. A. W. MCCASLIN.

A Hardening Query From England.—Will some one tell me the proper way to harden punches and shear blades? I have a punching and shearing machine combined and I have trouble in getting the small punches to stand. They start bending where they are turned down, just above the point and sometimes they break off. The shear blades chip on the cutting edge, and as I use it a great deal on wrought iron, I should like to remedy this. Also, should the punches be kept square on the end? I cannot imagine a smith being without your paper, which is both instructive and interesting. I find it a great help to me in my work. W. J. HOLDEN.

From Texas.—I enclose money to pay for my renewal subscription, together with a new subscription for a neighbor. I shall try to get others in the business to subscribe. I have come across several mechanics who pride themselves on having mastered their trade, and who will not therefore give books and papers on their trade notice sufficient to appreciate their advantages.

The American Blacksmith has been of great help to me, by increasing my skill as well as by its advertisements of material and new tools. I got a car load of the New Etna blacksmith coal that you recommended me and will say that it is the best of blacksmithing coal I have ever tried and cannot be beaten. A. E. HEISTER,

A Chatty Letter.—I am very much pleased with my paper. It can't be beaten. It is the only paper that I have seen that is worth anything to me. I wouldn't be without it for any money. I am doing all I can to induce my neighbor smiths to take it.

I saw in your October number a way to remove old spokes. I have a way which I think is better than that. I take a ring about three inches in diameter, put it on the spoke and make a wedge, driving it through the ring on top of the spoke with a hammer. It never fails to pull and does'nt injure it at all. If a new spoke is driven and doesn't suit you, it can be pulled out by this method O. K. C. E. MARKES.

An Interesting Letter.—Enclosed find money order to pay our subscription up to February, '05. We are very grateful to you for sending us your valuable paper which we feel that we cannot do well without.

On July 15th last we bought of the Witte Iron Works Company of Kansas City, Mo., one of their three-horsepower gasoline engines, and with it we operate a 10 by 40-inch screw-cutting engine lathe, a 26-inch Silver band saw, 14 by 1½ emery wheel and buffer, rip saw, cut-off saw, 14-inch drill, and intend to place in our shop a trip hammer, as we find we have power to spare. The consumption of gasoline is but a trifle. We wish to say that no shop is complete without an engine and would cheerfully recommend the Witte to any contemplative purchaser. OBERG BROTHERS.

A Few Questions.—I am very anxious to secure a book giving designs for scrolls and bent ornamental iron works, and if any brother can tell me of such a book, I should like to hear from him through THE AMERICAN BLACKSMITH.

I should also like to ask the question of how coal is washed.

I also desire to have Mr. Swartz explain how he makes the drilling jars as mentioned in the October issue. H. W. POPE.

In Reply.—There is a book published by W. T. Comstock, of 23 Warren street, New York City, that has a large number of fine plates of different designs, both in ancient and modern wrought iron work—title "Architectural Wrought Iron," price $2.00. It is very hard to get books of this kind, but this one is good. J. GOOGERTY.

In Reply.—For Modern Iron Work. "Schmiedearbeiten aus den besten Werkstætten der Gegenwart" published by Ernst Wasmuth, Berlin, 1893.

For Renaissance. "Wiener Schmiedewerk des XVII. und XVIII. Jahrhunderts" by Dr. Albert Ilg and Dr. Heinrich Kabdebo, Dresden, 1883.

For History. "Monographien des Kunstgewerbes—Adolf Bruning—Die Schmiedekunst," published by Herman Seeman, Leipzig.

These books can be procured from Mr. Bruno Hessling, 64 East 12th Street, New York City. RICHEY, BROWNE & DONALD.

In Answer.—I give below in the order of my preference the names of three good collections of plates of German work.

Die Kunstschlosserei des XVI, XVII und XVIII Jahrhunderts by Konradin Walther. Published by Konrad Wittwer, Stuttgart.

Die Kunstschlosser by Ferdinand Moser, Berlin.

Moderne Kunstschmiedearbeiten—Erste Serie by Franz Brechenmacher.

Published by Ch. Clacsen & Co., Berlin.

A good little handbook of moderate price is "A Handbook of Art Smithing" by Franz S. Meyer, English Edition. All of these books and many more can be obtained from Bruno Hessling, No. 64 East 12th Street, New York City. I hope that this may prove of service. WM. C. STIMPSON.

In Reply.—The method of making drilling jars will be described and illustrated in the January issue of THE AMERICAN BLACKSMITH. [EDITOR.]

A Good Hoof Parer.—In answer to the question of O. W. Dilts, in regard to buying the best tool for paring the hoofs of horses, I would say, this is a very important question. I think I am very ably prepared to answer this question, as I have used almost everything in the way of tools for dressing hoofs. There is one tool which I think far in the lead today of all others, and that is the Giant Hoof Parer, No. 52, manufactured by the Champion Tool Co., Ltd., Conneaut Lake, Pa. It is a new invention, but I recommend it to my brother smiths R. S. Mercur. Centralia, Pa., division superintendent of the Lehigh Valley Coal Co., has supplied a dozen tools or more in his collieries and also recommends the "Giant."

I find THE AMERICAN BLACKSMITH a very interesting and valuable paper for blacksmiths. MATTHEW DAPP.

An Old Texas Shop.—Please find enclosed $1.00 for my subscription to your monthly paper. I have had my shop "struck," and will send it to you just as soon as it is finished. The shop that I am working in was built in the year 1852. It is three sides brick and one side plank. It was built by James Ramsey, the oldest settler in Gonzales, and also a first-class blacksmith. He lived to be 98 years old, was raised in a shop and raised to work, and learned his trade perfectly before he died. He died five years ago, leaving about $10,000 worth of property to his wife. I think I have got the worst looking shop in the state of Texas and the oldest, from what I can learn. My business is mostly horseshoeing J. J. SCHAUMLEFFEL.

Five Years in Advance.—If there is one thing gratifying above all others to the publishers of THE AMERICAN BLACKSMITH, it is the esteem in which this journal is held. It is constantly being manifested, not only in words, but in other ways as well. Many subscribers pay not only two and three years in advance, but for five years. Mr. J. B. Baker, blacksmith and wagon builder, Sanitaria Springs, N. Y., has paid up his subscription for the next five years, as the most substantial form of expression of his value of THE AMERICAN BLACKSMITH. We hope to have every one of "our folks," whose lives are spared, as regular subscribers to THE AMERICAN BLACKSMITH for the next five years, together with thousands of others, and we have concluded to make a special price whereby they will save money by remitting in advance for five years' subscription. The prices for advance long-term subscriptions are as follows:

Two years	$1.60
Three years	2.00
Four years	2.50
Five years	3.00

Encouragement.—Readers of THE AMERICAN BLACKSMITH are at perfect liberty to make any suggestions whatever for the purpose of making these reading columns more suited to their needs. In fact the publishers will be glad to have them do so. If, on the other hand, there are any features about the paper which please subscribers, their appreciation and encouragement will be welcomed. Encouragement may be manifested in many different ways. Say that you like the paper the next time you write. Tell your friends about THE AMERICAN BLACKSMITH and advise them to subscribe. Renew your own subscription promptly when it expires. Mention THE AMERICAN BLACKSMITH to our advertisers when you write them. Send us some new subscriptions—have a try at the $25 subscription prize. These are some of the ways in which you can show your appreciation of THE AMERICAN BLACKSMITH [EDITOR.]

The Ills of Poor Shoeing.—It seems to me that the most educated man can learn something new every day, especially in the line of blacksmithing and horseshoeing. These trades, I am convinced, are away behind others. This is certainly true as regards improvements in horseshoes and what a horse ought to have on his feet for comfort, durability and safety on hard pavements in large cities. Whenever I am out on the streets, I cannot help keeping my eyes on horses' feet, watching them slipping and sliding over the stone pavements. I contend that a draft horse can pull a heavy load without having enormous shoes with big toe and heel calks. It is a shame that these heavy work horses are not shod with more judgment and care. Horses are brought to me only too often with bad corns, or the heels cut clear down to the hair, or else chopped away at the toe. I suppose every horseshoer with any amount of trade has the same experience, horses brought to him with feet disfigured or injured by poor shoeing. I do not mean to criticise, but there should be some way of protecting the dumb brutes from unskilled workmen such as these. M. A. M.

Spoke Removing.—Please find one dollar for my renewal subscription. I would not miss a number for the price of two years subscription. I expect to take THE AMERICAN BLACKSMITH as long as I live and am able to read or hear it read. The reason why I do not wish to miss a copy is for fear that it will contain some new device or something valuable which I do not know. I have passed my 66th mile-post, and am vigorous, healthy and able to do a good day's work in the shop, and I love it too. I often smile at some suggestions as to doing work on wagon wheels when they are preparing the old hub to put in new spokes; one in particular whose modus operandi is to cut the old spokes off flush with the hub, and then bore a hole in it and screw a lag bolt into it to withdraw it out of the hub. I can take them all out of the hub before he can get one-third of his out. My way, where the spoke is broken off flush with the hub, is to take a brace bit just the size of the mortise and bore into the spoke and then take a small chisel and slit out the remainder by sections or take a small gimlet bit and bore into the broken spoke to the box and insert a small stock of dynamite and blow them out if I am in a hurry to get over the fence, etc., but where there is enough of the old spoke left I saw a notch in it and knock it out with a hammer. I remain as ever your eager and constant reader. D. J. LESSEL.

A Newsy Letter.—Enclosed find order for one dollar for which send me your paper for one year. I find it to be all you claim for it and to be a great helper in my business.

I will give you an idea of business in Mississippi. I began at the place I am now at about two years ago, and it was a very poor stand. Pontotoc is a town of about 600 population and only one shop—I mean good shop, but I have a great deal to contend with in the county in small shops who do work for almost nothing. I came here as I said before about two years ago, and when I took the shop there was only one forge in it and a very sorry set of tools. Now I have two big forges and work three men. I have raised the business from about $500.00 a year to about $2,000.00. I have also raised the prices of everything, shoeing from 80 cents to $1.00, axles from $1.25 to $2.25 and everything else in proportion. I am only 27 years old and I need all the help I can get. I find more good things in your paper than any other paper, so I want it as long as I am a blacksmith.

I will give my brother smiths a good recipe for tempering a spring. Take three pounds beef tallow and one pound of beeswax, mix together, heat your steel to a working heat, dip in this solution, let cool, and hold over your clean fire till the oil is burnt off. Put it somewhere that the air cannot get to it (say in your cinders) till cool, and you will always have a good spring. To temper a tool, axe or cold chisel add about 1 pound English Resin to the above and temper the same, only cool in the open air. I hope this will be of some good to somebody. D. C. HOBSON.

Stocks for Horseshoeing.—I notice in the November issue of your journal an inquiry by Mr. Bailey, asking for information as to the best "Shoeing Rack"

Horse stocks or shoeing racks are appliances designed to hold the horse in a convenient position for operating upon him by the veterinarian or the blacksmith. The old method of setting shoes is attended with more or less physical danger, depending upon the gentleness of the animal, and the extent of his breaking. At best it is a most arduous task, one requiring great physical endurance, and is always attended with many elements of hazard.

For many years inventors have been designing and building stocks for this purpose. In the patent office at Washington are to be found a very large number of different designs, but strange to relate, but very few of these machines have ever proven practical.

Most of them are clumsy, cumbrous affairs possessing but little if any merit, awkward to handle and lacking in the very essentials of practical stocks. The elements to be considered in a good horse stocks are: Safety, both to man and horse. Comfort, both to horse and man. A good stocks is one that will enable the horseshoer, or the veterinarian, as the case may be, to securely hold and effectually control the animal while he is in the stocks. A vicious horse is usually one that possesses a sensitive, nervous temperament, and it is of the utmost importance that while he is confined in the stocks, that he should be held in the most natural position possible; that the operator have absolute control of his feet, and in holding them, to do so with the least possible friction. Many vicious horses struggle through fear and some horses struggle constantly while confined in the stocks. Hence it is essential that his feet be held in such a way that his struggles will not cause him to strain his muscles and tendons. Another essential of a good stocks is such an arrangement as admits of his being quickly secured, quickly shod and quickly released after the shoes are set.

If you are looking for a shoeing stocks, the first thing to ascertain is whether the stocks will hold the horse securely in a natural position. Second, can the feet be held in a convenient position for shoeing? Third, safety to the horse. Fourth, safety to man. Fifth, quickness of operation. It is highly important to have a stocks that will admit of two shoes being set at the same time. Last, but not least, is simplicity of construction, and an easy, quick and effective means of releasing the horse, without danger, after he is shod.

Many successful stocks embrace what is known in horse surgery as a "sling," and the best is one that enables the operator to control the sling with greatest ease and dispatch. The cuff and foot holding appliance is the next essential. The halter arrangement for confining the head and the breast, and shoulder stays to prevent rearing and plunging are also most useful accessories. C. E. MILLS.

The Independent Farmer.—I have noticed in a recent issue of The Sun of blacksmiths raising the price on horseshoeing from 25 cents to 35 cents for new shoes, also from 10 cents to 12½ cents for setting. Why not ask 50 cents and be done with it? They would be sure of getting it. For the benefit of those who may read this, I may say the writer is a farmer who shoes his own horses, buys his shoes the same as the blacksmith, and pays about 4 cents per pound, or from 3 cents to 5 cents per shoe, according to size. Think of it! Figure it out. What are you taxed for shoeing? A set of medium shoes will cost about 20 cents retail, and you are charged $1.40 to get them put on, or, in other words, the blacksmith receives $1.20 for his work and about 5 cents worth of coal and nails. How long is he putting four shoes on? Figure it out. Talk about independence! How did your last load of hogs or grain hold out with your own weight? Don't begin to complain. If you do you can just take your stuff home again or take

the buyer's weight. That's independence.

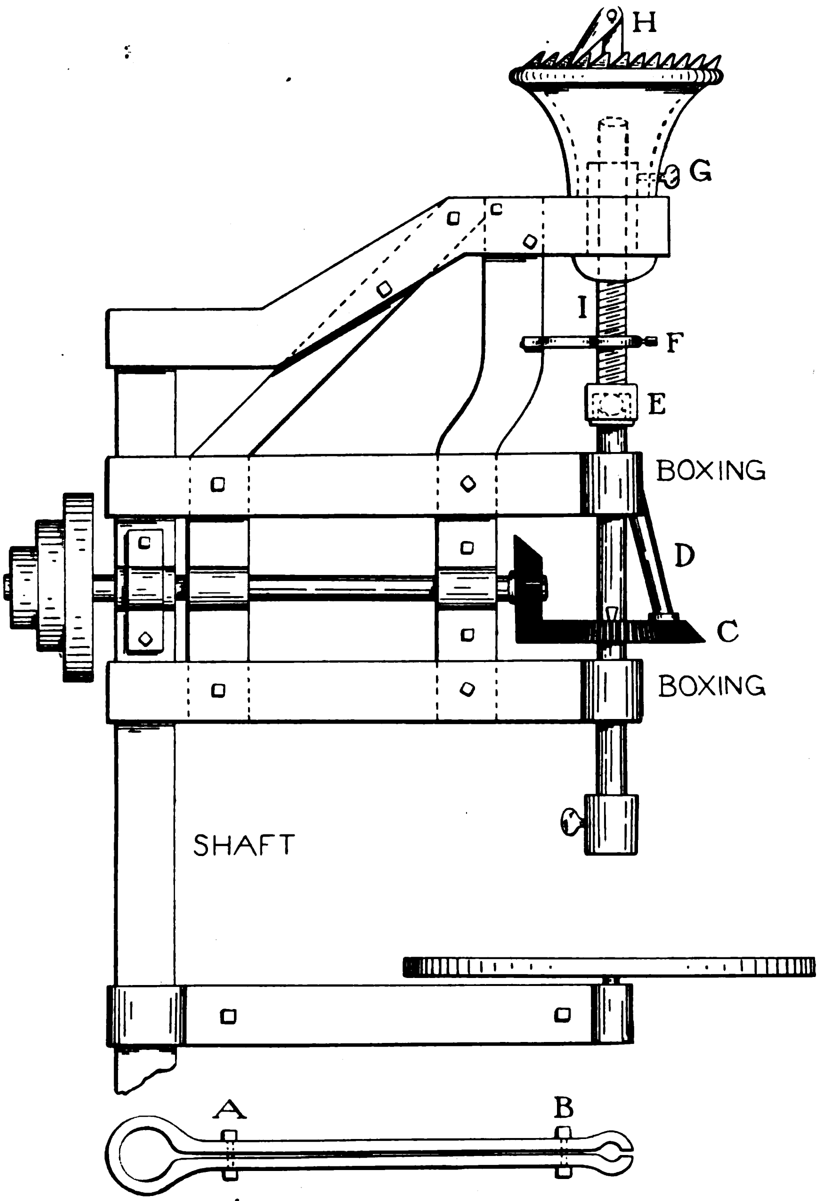
FARMER.

The foregoing clipping is from a recent issue of the Farmers' Sun, a publication in the interest of farmers issued in Toronto. The article is of value to the horseshoers, showing that steps have been taken to get a little better pay for the hard work of horseshoeing in Canada. Your correspondent assisted by two brother smiths have taken the initiative steps in this locality with the result that instead of 10 cents for resetting a shoe one now gets 12½ and for new shoes we get 30 cents instead of 25 cents as under the old conditions.

The task was a comparatively easy one and I was agreeably surprised to see all the brother smiths fall in line. In these prosperous times the smith has a full right to enjoy a few of the bounties of nature, and if he don't, it is his own fault. As prices of nearly everything have advanced that is needed to enable the mechanic to live and decently support himself and family, no right-thinking man will or can find any fault in his taking some steps to protect himself against pauper wages, or remunerations, and if anyone kicks as a farmer does, why let him kick. Now men of his stamp are to be found in all farming communities, but happily they are the exception, for if otherwise yours truly would soon quit and join the ranks of the downtrodden, independent farmer, and others would follow. Now that individual, whoever he is, belongs to the class whose sole aim and object is to make money and everybody should contribute to that end. He owns up that he shoes his own horses and would do so no matter how cheaply he could have it done by some experienced mechanic, and why?

Because he begrudges the little hardearned money that he would have to pay to have it done properly. He claims that there is an enormous profit in new shoes. Now he tries to lead the farmers to believe that it takes only a few minutes to put on two new shoes. He gives no credit or makes no allowance for the experience the expert smith has undergone before he was enabled to shoe a horse properly, but reasons on the line of the person who had a tooth extracted by a novice who worked over two hours before he got the operation completed, pulling the patient from the chair to the floor before he could yank the tooth out, and then only charged the man 25 cents. Later on he had one extracted by a dentist who did the work in a minute, but charged 50 cents. The man kicked about the price and to show the dentist that he was an extortioner, said: "The other time a man worked for over two hours getting the tooth out and only charged me 25 cents and you want 50 cents for a minute's work. I shall patronize the other man in the future." Now as I said before such men are fortunately the exceptions, otherwise mechanics would give the country smithy a wide berth. My reasons for writing this are that it shows that a movement in the right direction is on the way in Canada among the smiths and the sooner it is adopted by all, the better. The old saying that the Lord helps those that help themselves, may well be adopted by our craft, and if this is the means of helping to better conditions of things I feel amply repaid for my trouble.

CANUCK.



A HOME MADE DRILL PRESS.

A Home-Made Drill—In response to requests to know how I made my self-feed drill, I give herewith a sketch and description of how it is constructed. Referring to the illustration, the main frame of the drill is made of a piece of 3-inch shaft. The drill table is held by an arm, a top view of which is substantially as shown in the lower smaller drawing. By loosening the nut A, this arm may be moved up or down on the frame shaft, thus raising or lowering the table. The latter is made from the end of a beater of a thrashing machine, with a 1½-inch trunnion fitting into the arm B, holding the table. Five braces or arms carry the main drill spindle, the drive shaft and the feed mechanism. The three horizontal arms are made out of steel, 3 x ½-inch, bent very much as indicated by the table arm, with the exception that the smaller outer end has a piece of sheet iron put around it and bolted to the arm. Room must be left for babbitt around the spindle, at the points marked "boxing" on the figure. The upper one of the three arms has to be bent up four inches as indicated, but otherwise is shaped the same as the rest. The two vertical braces are bent as shown; these go in between the two plates or leaves of the horizontal arms and are securely bolted, as shown.

In the end of the top arm is placed the thread boxing of the feed screw, I. This boxing is indicated by dotted lines, and is 4½ inches long. I made it with a 1½-inch hole in it, then placed the feed screw in place in it, and after oiling the screw, poured babbitt metal in, thus forming my screw box. The connection between the drill spindle and the feed screw, as shown at E, is a ball in a recessed head on the end of the feed shaft. This allows the drill spindle to turn constantly, and the feed screw to push it down at any time. As the feed screw must move only up or down, brake or guide F is useful to keep the screw from turning around. The feed screw itself is ⅞-inch in diameter, 8 inches long, with nine threads to the inch. The feed wheel at the top is arranged to tighten up by means of the set screw G, so as to turn the screw boxing and feed the drill when desired.

The self-feeding arrangement is very simple. An eccentric cam on the hub of the gear G moves the rod D in and out, by the aid of a spring (not shown). The rod D has a roller on its lower end which the cam touches. This rod runs up and rocks the ratchet dog H back and forth when the self-feed is in operation, thus moving the feed wheel and the feed screw down. The rod (shown only at D) is pivoted at the upper arm, and is made light enough so that when the feed pressure comes on the drill bit too hard, it will spring and not let the dog push the wheel until the drill bit has cut some metal out of the piece being bored. A thumb screw on the rod D is used to limit its swing, and thus regulates the rapidity of the feed.

The horizontal drive shaft has a 4-step cone pulley on one end and a small bevel gear on the other. It is supported as shown. The one pulley is driven by belting to a jack shaft on the floor; this has a cone, together with tight and loose pulleys.

I have found this drill most serviceable, and hope the description of it will be of some benefit to some of my brother craftsmen.

WM. EXLINE.

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Special Issues.

A few words regarding this issue of THE AMERICAN BLACKSMITH may not be inappropriate here, owing to the fact that it will be read by a great many blacksmiths and wagon builders who have not before had an opportunity of examining the paper. To them we would especially say that January is a special issue only in the fact that double the usual number of copies is published and mailed. It is a common practice of many publishers to put forth special issues once or twice a year, resplendent in color and containing a large amount of valuable reading and information, but lo, when succeeding issues of the paper reach him who has unsuspectingly forwarded his subscription to the publisher, they are found to be as lean and emaciated as the proverbial church mouse, such reading as they do contain being clipped from other papers and affording but scant news to the subscriber.

With the thought only of those whom THE AMERICAN BLACKSMITH now makes its first bow, allow us to direct attention to the fact that the publishers of this paper guarantee readers twenty pages of solid, unpadded blacksimiths' reading matter each month, from the pens of the foremost craft authorities, with no trade puffs or stale clippings, and to the fact also that this January issue contains no more and no less of reading than is to be found in the eleven other issues of the year, the same standard of reading pages, both as to quantity and quality being maintained throughout the twelve months.

A Movement to Secure State Lien Laws.

Just a line here to say that as a result of efforts on the part of The American Association of Blacksmiths and Horseshoers definite assurances have been given that the lien law bills, which have been carefully drawn up by the Association, will be introduced in a number of States at the next session of their legislatures. But, needful and just as such laws are, their introduction does not necessarily mean their passage. They must be passed through the efforts, not of this association nor of the State legislators, but of the blacksmiths and wagon builders for whose good the bills are intended and who by liens on horses or vehicles will be able to collect money that is owing them. The AMERICAN BLACKSMITH is the official organ of this Lien Law movement, and is directing the work. We want every craftsman whose eye meets these words to write to us to learn how he personally can greatly help on the good work and at no expense to himself whatever.

An Authoritative Treatise of Horseshoeing.

One of the best series of horseshoeing articles we have ever published commences with the present issue of THE AMERICAN BLACKSMITH. This series constitutes "A Treatise on Horseshoeing," from the pen of John W. Adams, A. B., V. M. D. The subjects of the various articles, in order, are as follows: Anatomy of the Foot; The Growth, Care and Characteristics of the Hoof; Types of Feet; Preliminary Examination for Shoeing; Preparation of the Hoof; Characteristics of the Shoe, Special Peculiarities of the Chief Classes of Shoes; Hot Fitting; The Bar Shoe; The Rubber Pad.

Mr. Adams is a Professor of Surgery and Lecturer on Shoeing in the Veterinary Department of the University of Pennsylvania, and is an authority on horseshoeing matters, so much so that the Department of Agriculture of the United States has seen fit to issue this treatise in bulletin form.

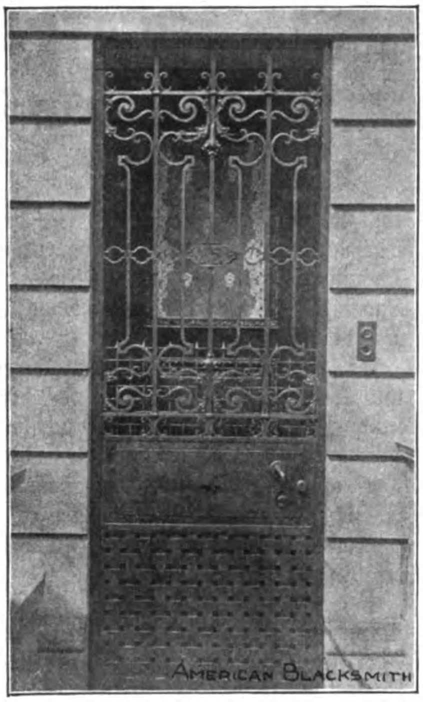
Each topic is concisely and clearly discussed, and illustrations are introduced in explanation wherever necessary. To the horseshoer this series will be exceedingly valuable. Not one number should be missed.

A Remarkable Racing Season.

Never before in the history of American horse racing, it is safe to say, has there been a season so remarkable for record smashing as the one just ending. To briefly review some of the many achievements, Dan Patch placed the world's record for pacers on a half-mile track at 2.03¼, earlier in the season having taken records for the fastest mile by a pacer and by a pacing stallion, 1.56¼. This famous horse likewise holds world's records for the fastest half mile, 56 seconds, and the fastest wagon record by a pacer, 1.57¼. Lou Dillon cut the world's trotting record to 1.58½, placed the record for a second heat at 2.04¾, and trotted the fastest two-heat race, each heat in 2.04¾. Among her other records is a figure of two minutes to wagon against time.

Cresceus reduced the trotting stallion record to 1.59¾. Major Delmar brought the world's record for trotting geldings down to 1.59¾. The four-heat race record was taken by Dan T. who won the last two heats of such a race, the four heats being trotted in 2.06¾, 2.07¼, 2.08¾ and 2.07¼. A slice of four and one-quarter seconds was taken from the world's record for team trotters when Monk and Equity went a mile in 2.08¼. Prince Alert reduced the pacing

record for geldings to 1.57, and Dariel cut down the pacing figure for mares to 2.00¼. The record for a mile and a quarter pacing was reduced to 2.38 by



WROUGHT IRON ENTRANCE DOOR.

Nervolo, and Locanda placed the record for a mile and a half, pacing, at 3.15¼. It seemed as if almost every day brought the news of a new world's record, and the prospects are that another such season will not come for many a long day. The long-dreamed of two-minute trotter was realized in Lou Dillon, whose picture appears on another page of this issue.

The Education of a Tradesman.

The full value of a good education is not felt all at once. Two men set out in the same trade. One has a sound schooling, the other has spent his school-days in the shop, learning practically what the other has acquired in theory.

At first the shop-trained man goes right ahead. He knows just what to do and how to do it, while the other flounders about all at sea amid the practical problems that he knows only on paper. Time goes on, and the shop-trained man's experience ripens slowly. The other in the meantime is cultivating just the practical ability that he lacked. His mind has been trained and sharpened up so that he easily recognizes his own needs, and is able to fit a means to an end. A little experience goes a long way with him. One problem solved solves many others, because he is a reasoner.

So, at the end of ten years, the two are compared again. The shop trained man has advanced slightly. The other has won a wide experience, has become an expert craftsman, and is, over and above this, a well-educated, intelligent citizen, probably earning many times as much as his rival.

It is a somewhat hard matter for the practical man, in the rush of a business life, to gain an education for himself, but it can be done. Night schools and correspondence schools afford the opportunity and they are boons indeed to him who must devote his daylight hours to manual labor. In these days of close competition it is a matter of necessity.

Ornamental Iron and Copper in Architecture.

The neat wrought iron door here illustrated is the entrance to a residence in New York city. A basket-work effect is introduced in the lower portion, which is both pleasing and unique. The upper portion presents a graceful arrangement of lines and curves.

The stair and elevator enclosure also illustrated are to be found in the Essex Hotel, New York city. The design here is more complicated, but is particularly well worked out. The border around the elevator doors consists of a series of circles interlaced and strengthened by small circular plates of ornamental design. This forms a striking outline on frame to the central portion.

One of the finest bits of art metal work that has come to our notice is seen in the remaining half-tone. This piece is seen in Riggs' National Bank. This lamp standard here depicted is of bronze. Winged lions at the base give the impression of strength and majesty. These support a handsome column of the Corinthian order. This is topped by a globe, and upon this globe, again, is a small column and globe similar to the lower one. Surmounting the whole is perched an eagle. Thus is strength evident at the base and airy lightness at the top. The idea is so good and the whole piece so harmonious and graceful that the designer deserves great credit. It is one of the handsomest pieces of ornamental work which has come to our notice. All three pieces are the work of Richey, Browne and Donald, architectural iron workers, Long Island City.

Talks to the Jobbing Shop Painter.—10.

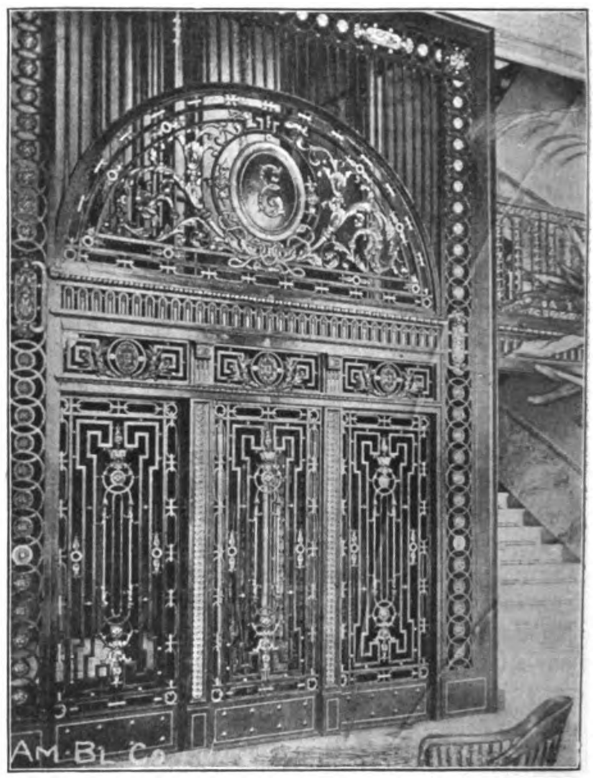
M. C. HILLICK.

Painting the Medium Grade Buggy.—Priming.—Putty.—Surfacing, Striping and Finishing.—Painting the Body. Rubbing Roughstuff.—Applying Color and Finishing.—Etc.

Preparations for the coming season's work are now practically due in all carriage paint shops. Not a few jobbing shop painters have ventured into the business of buying carriages in the white, and painting and selling them, handling this line of trade in connection with their regular painting business. In this way the shop is kept active during seasons when the finding of new business is in many respects as difficult as the discovery of the north pole.

It is with the painting of this class of work, and particularly the class ordinarily accepted as cheap, that this article has to deal.

The word cheap, as here used, does not necessarily mean that the article to



A HANDSOME ELEVATOR ENCLOSURE.

which it applies is of an inferior quality, but rather that the buying and selling price is cheap, taken in connection with the substantial quality of the article handled.

The first step in the process of painting is the priming. Of primers there are divers kinds and, of course, of varying degrees of excellence. Not a few carriage painters elect to use ready prepared primers, or new system surfacers, as they are called, while others hold fast to that which is good—the traditional lead and oil system. Under conditions which allow for the proper drying of the material, white lead, as a surfacer, has no equal, but the limits of time often forbid the use of oil and lead. In such cases, and other cases unnecessary to enumerate at this time, the new surfacer systems may be used to advantage. The writer of this article has for the past ten years been connected with a painting business in which a patent system of surface, from which lead is supposed to be practically eliminated, has been almost exclusively used, and the countless surfaces brought to a finish upon this patent surfacing system have, with but few exceptions, proved of high class durability. It is not so much, therefore, the kind of primer, but the way it is applied, the preparation of the surface, and the allowance of time made for the adequate drying of the primer, that deeply concerns the painter.

In the first place, sand paper the job clean and smooth throughout—body and running parts. The smoother the job is worked down at this point the less work of sanding upon the priming or other coats. Then dust off, and lay on the primer with a good oval bristle brush. Brush the coat out smooth and uniform, and set aside in a dry, warm air to harden. In sandpapering on the priming coat, once it has sufficiently dried, avoid cutting through and striping sharp corners and angles of needed protective material. If the primer be made of lead and oil, take white lead ground in oil, three parts; lamp black, one-half part; finely ground yellow ochre, one and one-half parts. Mix in three parts raw linseed oil, one part rubbing varnish and one part turpentine, adding a tablespoonful of coach japan to each quart of the mixture. For second coating of the running parts with the lead system use the lead shaded to a normal gray with lamp black, and mix with raw linseed oil, one part, turpentine, three parts, and lay on with an oval bristle brush. When this coat is dry proceed to putty—glaze all open, eaty portions of the surface, using ordinary carriage putty thinned to a consistency that allows the pigment to work fully from the knife blade. All open cavities, etc., putty smooth and level.

A good reliable carriage putty, a standard putty perhaps we should say, is made of dry white lead mixed in equal parts of coach japan and rubbing varnish.

Formula No. 2—Keg lead ground in oil, two parts; dry white lead, one part;

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best bolted whiting, one part. Liquids: rubbing varnish and coach japan equal parts.

Formula No. 3—Keg lead ground in oil, four parts; dry white lead, one part. Liquids: Rubbing varnish and gold size japan, equal parts.

But of putty formulas there are no end, hence these must suffice, and they are sufficiently reliable to insure first-class work under proper methods of use, both for bodies and running parts.

The second coat of lead, or of patent system surfaces, and the putty glaze, and the putty, having been surfaced down smooth and fine mix a third coat of lead, using a normal gray pigment, mixed to a consistency suited to be applied to the surface with a camel's hair brush. Use turpentine alone in the mixing, adding as a binder, a tablespoonful of raw linseed oil to each pint of the mixture. This coat should go on smooth and clean, and flatten out as nicely as a coat of color. When dry, sand off lightly with No. 00 sandpaper, polish with a tuft of curled hair, and the running parts are now ready for the color. Apply one coat of color, then one coat of color and varnish. When this color and varnish is dry sufficiently, dip a moist sponge into No. 00 pulverized stone and rub over the surface just enough to knock off the glass, together with removing dirt, motes, etc., then wash up and stripe. Use tube colors for striping purposes, and aim to make the striping to harmonize with the general color scheme, the two line stripe being best suited, on the whole, to this class of work. In handling work among country buyers, neat and effective striping is a potent factor in selling the work. It assists to conceal the defects in surfacing and finish, and carries with it a certain element of value to the user not obtained in any other way. In case the job is to go in the ordinary class, finish directly upon the striping with a single heavily flowed on coat of heavy gear finishing varnish.

If a "special" job, apply a coat of clear rubbing varnish, and in due time rub this coat with No. 00 pulverized pumice stone and water, wash up thoroughly, and finish with a fine, high class gear finishing varnish.

The body having been primed at the time the running parts were, and with the same material, and set aside for proper drying, may in due season be taken in hand and puttied with the formula No. 1 putty. This putty being dry, the first coat of surfacer is in order. Make this first coat of roughstuff, to answer both in the capacity of a lead coat and a roughstuff coat. It should consist of three parts of any good American roughstuff filler and one part keg white lead, proportions being by weight, reduced to a thick paste with elastic rubbing varnish and coach japan equal parts and then thinned to brushing consistency with turpentine.

The day after this coat is applied, look the surface over carefully and putty any places which may have been overlooked at the first puttying. The following day this coat may be re-coated

with a roughstuff mixed thus:—Equal parts, by weight, of American filler and keg white lead mixed to a heavy paste with equal parts of quick rubbing varnish and coach japan, the mass then cut to the proper consistency with turpentine. Two coats of this roughstuff may be applied per day, and four coats of this, and the coat made by the first formula, should suffice to give the proper surface. In the last coat of roughstuff mix sufficient yellow ochre to distinctly alter the color. This will serve as a guide coat in rubbing the surface and will save the expense of the guide coat usually applied.

Stand the surface aside for a week to dry out, after applying the last coat of roughstuff. In rubbing the roughstuff use the German rubbing Fabrik. This rubbing stone yields a clean, smooth surface if properly handled. Rub with long straight strokes of the stone and use plenty of water to keep the surface from gumming up. Aim to keep the surface free from scratches or bruises. Keep the inside of the body and seat as dry as possible, and when the surface is perfectly rubbed set aside for twelve or fourteen hours for the moisture to dry out. Then run over it with No. 00 sandpaper to remove gritty substances, and to polish it. Sand the inside of body and seat thoroughly, also.

Paint both sides of bottom boards of body and seat. Then apply color to inside of body; lastly, outside. Then color and varnish inside and out of body and seat. When dry, rub this coat lightly with No. 00 pulverized pumice stone and water, and apply a coat of rubbing varnish with enough black or body color in it to keep it from greening or discoloring. When dry, rub this coat carefully with pumice stone, as above, and water, wash up, and, for ordinary work, finish with a heavy, rich flowing body varnish. For a "special" job use an additional coat of rubbing varnish. All these coats of varnish should be flowed on, rather than brushed on, as such coats give a richer, deeper brilliancy of finish. Use only clean colors and varnishes. Also a very essential feature in work of this kind, is the use of clean tools. Work in warm quarters, free from dirt, otherwise dust is very apt to rise, which will surely spoil the brilliant finish of your job. Another important point, be clean personally, when at this work. The finish obtained will amply repay all the care and skill lavished upon it.

(To be continued.)

The Wagon Work Prize Contest Award of Prizes.

The prize contest on wagon work, though opened only a short time ago by this journal, was one of the best and most vigorous ever held. We wish to thank all those who participated. The standard of articles submitted was unusually high, many of them so equally good that considerable time and consideration on the part of the judges was necessary before any decision could be arrived at. The following was the award:

First prize, $20.00, Nels Peterson, Des Moines, Iowa; two second prizes, $5.00 each, J. Vestal, Nacogdoches, Texas, and C. Youngstrom, Meckling, S. D.; three third prizes, blacksmith's aprons, George E. Brierly, Arva, Ont., Canada; Charles W. Briddell, Marion, Md., and G. O. Bishoff, Gainsville, Texas; fourth prize, yearly subscriptions to THE AMERICAN BLACKSMITH, R. O'Hearn, Monterey, Ky., M. A. Foster, Fort Wingate, N. Mexico, J. W. Breckenridge, Lawry, Md., and F. W. Price, Harviell, Mo.

We congratulate the winners on having sent articles which were judged the best of the great numbers submitted. We wish to call attention also to the fact that these prize winning articles have come from a great many portions of the country, an indication of the widespread interest taken. The prize articles and the best of the others will be published in these columns in this and following issues as space permits.

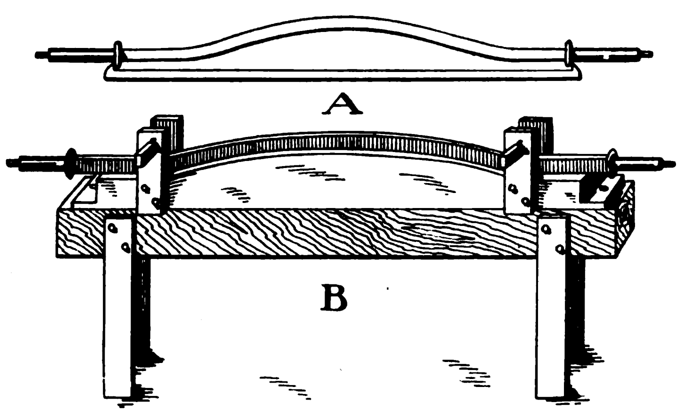
Wagon Building in the Factory.

Prize Article.

NELS PETERSON.

During the twenty-seven years that I have worked at the blacksmith trade, my experience has been varied and interesting. Starting at the age of fifteen in my father's shop back in Sweden, I was afforded every opportunity for learning, that I could never have received from anyone having nothing but his pecuniary interest at stake. The line of work done at this shop covered every thing, from building a threshing machine to making a padlock and presented chances for acquiring practical experience not enjoyed in many shops. Having served the required time of three years as an apprentice in that country, I was promptly advanced to the fire, to do less difficult forgings at first, but at the tender age of nineteen had charge of the shop.

Besides doing general repair work, we built machinery of every description, for dairies, wind-mills, distilleries, etc. The shop was first class for its time and locality. There was no such thing as buying a carriage or wagon ready made at that time or place; farmers or business men had them made to order, depending entirely on the village smithy for every thing in that line. All forging done at this shop was by hand. The motive power for turning lathes, drill presses, etc., in the machine shop was horse power. To iron a fancy carriage in those days was quite different from today, and required considerable skill and practice. Every piece from springs, axles, bolts, clips, rivets, and nuts, was forged by hand.



A—GAGE FOR MEASURING AXLE LENGTHS.
B—TRESTLE FOR SHAPING AXLES.

To forge an axle, we would take a piece of square iron the required size, swage the center round the proper distance, upset the square parts, where the collars and lips for bolting to the spring were welded on, then draw the ends to taper, and swage the spindle to fit the box, leaving it sufficiently large to allow for turning down in the lathe to a snug fit. In making the springs the stock was cut to length, the smaller leaf was drawn to taper and finished off, the main leaves upset to sufficient thickness, and with peen of hammer and sledge drawn out wide enough to turn the head. The main leaves were then bent to proper curve, and the smaller leaves fitted in their order. For the better class of vehicles platform gears were used entirely.

At the age of 21 I immigrated to the United States. In Chicago, Ill., I found employment in a tool factory but being of a restless spirit and desirous of seeing the country I visited many large cities and worked at various branches of the

trade. In the last 15 years I have followed the carriage business exclusively, for the last 11 years in Des Moines, Iowa. The firm I am with build about 5,000 jobs a year of varying styles, such as light family carriages, phætons, stanhopes, surries, buggies and some spring wagons.

I will now attempt to give you an idea of the way we do it here. The plant is quite large, being 265 feet long by 132 feet wide, two stories and basement with two railroad tracks and equipped with a 50-horse-power steam engine, which furnishes power for elevators and machinery. The first floor, south half, is occupied by the blacksmith and woodworking department running parallel; also a large stock room is located in this part. The north half of the same floor is occupied by the office, display room, and shipping department. The upper floor is used for paint shop, trimming and assembling room, and the basement for storage, some painting also being done here. All matérial is shipped here by the carload and unloaded at different parts of the building, for the blacksmith shop, the paint shop, the wood working and the trimming shop. A large stock room is provided with numerous shelfs and bins, all labeled, indicating their contents. From this room leads an elevator to the second floor. A receiving clerk directs his men where to place the different goods as they are unloaded, so he may know where to find them when called for. Goods that have to be transported any considerable distance through the factory are carted on trucks built for that purpose and so constructed as to admit of carrying a considerable load. All bodies and seats for the different vehicles are delivered at the elevator landing on the second floor, where they are primed as soon as possible to prevent them from absorbing dampness. When dry they are looked over and all small holes and other rough places are puttied, then from five to eight coats of filler or rough stuff, according to the grade of work, is applied, when they are passed on to the rubbing deck, where another gang of men do the rubbing, sand-papering and slushing. A coat of color is next put on, then color varnish. They are next ironed off and a coat of rubbing varnish put on, rubbed, striped, and again passed on to another room where they are finished, and finally stored in a dark air-tight room while the finishing dries.

The several coats are applied by men who are specialists, so that better work and more of it is the result. During these operations the job has passed through the entire length of the building, and is now located at the north end, where it is handy to the trimming shop and assembling room.

We will now return to the blacksmith shop and attempt to describe, in detail, the methods employed in this department. All stock intended for the blacksmith shop is unloaded at the west door. Bar-iron, tires, etc., are placed in racks, each rack being marked with size of iron. Springs are stacked at a convenient place for the men putting up gears and the axles, where they are convenient to a large pair of shears. Here they are unboxed, sheared off cold to the proper length for welding and brought to the forge, where they are piled, the left arm on one side and the right on the other. In welding axles a large fire is built to permit of heating several at the same time. The ends are heated to a white heat, brought out and upset by thrusting them against a heavy piece of casting placed on the floor for that purpose, then scarfed under the trip-hammer, to a shape much the same as an ordinary piece of iron is scarfed for welding, replaced in the fire and heated to almost welding point. Next they are brought out and emersed in the flux, replaced in the fire with the scarfed sides upward until the compound is melted sufficiently to adhere, then turned over and allowed to remain till brought to a welding heat, when they are withdrawn, and with a gentle tap against some object all harmful matter is removed before placing them under the hammer for welding. A fairly long lap is best and by rapid beating they are welded down sound and finished to the exact length, for which a gage is placed handy for measuring as shown in Fig. 1, A. As soon as the welding is completed, the axle while still hot is placed over a form, shaped to conform to the axle cap, wedged down and all irregular kinks taken out. A cast iron form resting on a wooden trestle is used, as is shown at Fig. 1, B. An expert smith and helper can weld from 50 to 75 sets per day, without missing a heat.

In setting axles the spokes of the wheels are made to stand plumb from the floor to the hub, that is, measuring the spokes from out to out at the hub, the measure will correspond with the outer edges of the rim on the floor. This operation of measuring is, however, never gone through with, as we use an automatic axle gage, by means of which one can tell to the smallest fraction of an inch how much pitch the axle has. No gather is put in the axles here, as it is deemed useless and even injurious and has been demonstrated by practical test that an axle with gather will cause the box to bind at the collar, creating undue friction, and impeding the momentum of the wheel, and cause the vehicle to run heavy. The top surface of the axle is then ground to a bright finish, glue applied, the axle cap put on by means of thumb screws and left standing till glue cools, when the thumb screws are removed and wood projecting over the axle is ground off and polished over a revolving drum, on which a heavy sheet of sandpaper has been fastened. They are now ready for the gear setter.

(To be continued.)

Facts about the Fire.

Use good coal always—all impurities as slate, earth and especially sulphur, are harmful. Good coal should break easily, appear glossy black all the way through, and should coke easily. Coal should be thoroughly wet before being put on the fire. Start the fire with coke, place "green" coal on top and around the fire. When the coal on top has been coked, the fire is ready for heating the iron. Putting fresh coal on the fire is bad practice—draw from the coke around the sides. Add the fresh coal to the outside and let it coke in turn.

Facts and Hints on Wagon Work.

Prize Article

GEO. E. BRIERLY.

Suppose that a wheel with a 4-inch tire comes to the shop to have a couple of new spokes put in. The tire is tight on the rim, and you do not wish to injure the wheel. Just take an old coarse saw and saw a piece out of the joint, strike a few sharp blows on the sole of the tire, and you will find that your tire will come off easily.

A wheel 2 feet 6 inches high with a 4 inch tire is sometimes a troublesome thing to rim. By putting on rims 2 inches higher than the wheels, you will overcome a lot of that trouble, as a bent rim will pull down easier than it will pull open.

When the bands on a hub get loose, do not take them off, and cut and weld them, it is unnecessary. Make a lot of thin wooden wedges. Then take a thin iron chisel and drive into the hub pretty close to the band, pull out and drive one of the wedges in its place. Do this all around the hub and the band will be as tight as necessary.

Light delivery wagon wheels should be riveted each side of the spoke, in the rim, to prevent the tenon of the spoke

from splitting it. Now, the hardware stores charge $1.25 for having this done. The rivets and burrs cost about 25c, which leaves $1.00 for two hours' work. Place the wheel on the wheel tub or horse, face up, mark where the rivets come and bore with a screw bit, which the rivets will follow tight, and drive your rivets in. Take the wheel off the horse and screw it face down on the iron tire platform, place the burrs on, cut the rivets the right length and rivet them. Proceed with the other wheels in the same manner.

Wagon bolsters are generally about the same size and shape. In spare moments make up several and paint them. The paint prevents the air checking them and also if a man is in a hurry you do not have to let the job go without paint.

In the country repair shop black is the color generally used for striping. To mix it so as to work free, take drop black and mix it as if it were going to be used as ordinary paint, then add enough heavy varnish to hold it together. It will then work freely and will not run. Yellow is also a handy striping color to have around the shop. It goes well with the gear in the red, wine color, black, green or brown.

If when setting the tire on a light wheel, you should pull it to dish, stretch the tire cold by pounding on the edge with a fuller.

When re-rimming a wheel do not drive the old rim off, because there is a danger that the spokes will move in the hub, and if they do they never are as tight again. Take some iron wedges and split the rim off from the back.

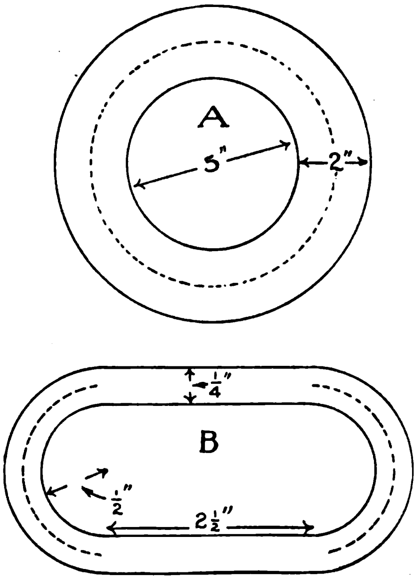


Fig. 1. CALCULATING AMOUNT OF STOCK FOR FORGING IRREGULAR SHAPED PIECES.

Suppose you wish to make a round stick. Take a square piece of wood which will make it the right size, trim it to eight faces and then round up as near as possible with the smoothing plane. Take a piece of maple, the end of an axle will do, and bore a hole in it the same size as you wish the stick. Now drive the stick through the hole, when it will be about as round as if turned in a lathe.

If when taking a weld on large iron the fire is dirty, take some salt and throw into it. It will clean your fire and make it burn brightly.

Sometimes a wheel comes to the shop with the tire spiked on. To drive the cold chisel between the rim and the tire is rather hard on the former. Find where the spike is, centre punch it, put the wheel under the drill and bore the spike out.

If the centre plates on whiffletrees are bolted on with 3-16-inch tire bolts they will not cause annoyance by becoming loose.

To tighten the box in a wheel do not wrap the box with canvas and drive in. It is sure to get loose again. Take a piece of pine board and split off a lot of very thin wedges. Place the box in the hub, get it centred, and fill up tightly between the box and the hub with the pine wedges. When you have driven in all the pine you can, get some hard wood wedges and wedge, as you would on a new job.

(To be continued.)

The Elementary Principles of Mechanical Drawing—8.

How to Calculate the Amount of Stock Required in Forgings.

When a mechanic has a drawing presented to him from which he is expected to make a tool, one of the first problems that confront him is: "How much stock will it need?"

This fact may be borne in mind: The finished forging, no matter what its form may be, will contain exactly the same number of cubic inches as the stock from which it was forged—with slight allowance for scaling.

In any case the dimensions will be given on the drawing, so if the piece to be forged should be a simple bar, for instance, the blacksmith may find the amount of stock by simply measuring from stock of the size and shape required.

When the forging is of irregular shape, the parts should be considered separately, and the results added together, to give the total number of cubic inches in the forging. Taking this amount of stock the blacksmith thus knows from the drawing just how much stock is required for each part.

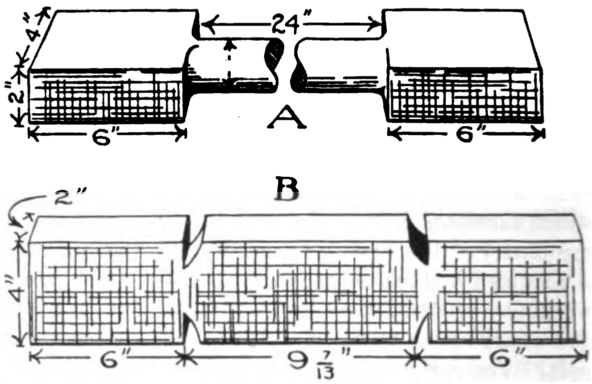


Fig. 2. CALCULATING THE SEPARATE PARTS IN IRREGULAR SHAPED FORGINGS.

The ring common occurs in tools, and the amount of stock required is easily found by the following simple rule: First, a few points should be noticed with regard to the nature of a solid ring. Referring to Fig. 1, a ring is to be forged from the drawing at A. Here the inner diameter is 5 inches, and the ring is to be of round two-inch stock. Then in the finished ring the iron on the inside of the ring, being formed from the same length piece as that on the outside, must have been upset, or crowded together, while that on the outside has been drawn out. In the center of the ring the iron will have kept its original length. Hence, by measuring the length of the center of the ring will be found the amount of stock required. From the drawing it will be seen that the diameter of this center portion (the dotted line) will be the same as the diameter of the inside, with half the thickness of the stock added to each end, which is just the same as adding the whole thickness of stock to the inner diameter. Now multiply this new diameter, which is 7 inches by 3 1-7 inches (or more correctly 3.1416), and the result is 22 inches. This is the length of the middle line of the ring, and gives the length of 2-inch stock required.

Where a link is to be made, the two ends may be considered as semi-circles (see Fig. 1, B.) and the side portions as straight bars. Suppose this link to be 2½ inches long and 1 inch across. The diameter of the semi-circles will be 1 inch and this added to the thickness of the stock

(say ¼ inch) will give 1¼ inches. Regarding these two semicircles as making one whole circle, proceed as before. Multiply by 3 1-7 which gives 1¼x3 1-7 =3 13-14 inches. Now the remaining length of the link will be 1½ inches for each side. Hence the stock will be 1½x1½ inches x 3 13-14 inches = 6 13-14 inches, or approximately 7 inches of ¼ inch stock, allowing for the weld.

In measuring irregularly curved pieces, as scrolls, it is a good plan to step around the outside edge with dividers, and then step off an equal number of the same spaces on paper. The length of the line thus obtained will be the distance around the curved edge.

In making a forging of the form shown in Fig. 2, the method given below is convenient. This piece consists of two blocks, each 2 inches by 4 inches by 6 inches, connected by a round shaft 2 inches in diameter. This will conveniently take stock 2 inches thick by 4 inches wide. First make cuts, as shown at B, and draw down the center to 2 inches. It will be necessary to know how far apart to make these cuts. And to do this first find the amount of metal in the central cylinder. This volume will be 1x1x3 1-7 x24 = 75½ cubic inches. This will require, of stock 2x4 inches, 75½÷8 = 9 7-16 inches of stock between the cuts. Each end will require 6 inches of stock, making a total of 6x2x9 7-16 = 21 7-16 inches.

In this manner any irregular forging may be divided into separate parts for the sake of calculation.

(To be concluded.)

Spreading the Foot.

C. W. METCALF.

In the November AMERICAN BLACKSMITH I noticed that one blacksmith advocated spreading the foot with tongs. I do not like to see a horse's foot spread in that way. I have a shoe which, if once tried, would result in the use of no other, and it would also stop the practice of spreading the foot with tongs. I used to make a bar shoe that I thought was a dandy, but I would not use it now.

I have worked in a country shop since I was twelve years of age, and used to scold my father for spreading the shoe with tongs after it was nailed on.

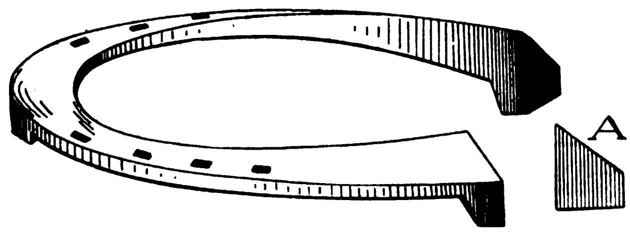
The accompanying drawing shows the shoe in question, and I believe its shape will be plainly understood from the sketch. A, shows the bottom view of shoe. Its essential point lies in making the hoof surface of the heels high on the inside and beveling or sloping away to the outside. When using this shoe in a bad case of contraction, there should not be any heel calks and the back nails should be left out. A horse can not step on this shoe without spreading his hoof, I care not how hard it may be. I should like to hear from other shoers as to their opinion about this shoe.

Shoeing for Forging and Speedy-Cutting.

M. A. AMMERMAN.

Having promised some time ago to give an article on horseshoeing, I shall begin by telling how I shod young Signal.

He came into my hands with fifteen ounces forward and five ounces behind. He scalped so badly I could not road him, shod as he was. I reduced the weight of his front shoes to eight ounces, then to five ounces, and then to three ounces. I found that I could road him without boots, or without his injuring himself. I took him to the track and when at his top speed he would go



A GOOD SHOE FOR SPREADING THE HOOF

into a pace. I called for the four ounce weights, tried those on him and he went into a rack, thus showing me that he was still out of balance. I called for the six-ounce weights and hung them on. Then he trotted like a spirit. I drove him a quarter in thirty-two seconds without a boot, and on examining him I found he had speedy-cut (this is an injury caused by the front foot striking the hind ankle). He was so tender I could not wear boots on him. Hence, I had to resort to shoeing him altogether to keep him from injuring himself. Having on five ounces behind, I began to increase the weight until I had nine and one-quarter ounces on him. I went again to the track. There was no end to his trot. He was perfectly balanced and could speed a two-minute gait without boots and never injure or touch himself in any way. I started him in a matinee race, and the fourth mile and last quarter in the mile, he trotted in thirty-two seconds. When we were twelve lengths from the wire we were even, and he finished six lengths in the lead. I never knew of a horse that had the wonderful bursts of speed that this fellow had, and now I hope that the reader in looking over this article will discover that a horse that forges and speedy-cuts can always be remedied by shoeing very light in front.

Tuyere Irons for Light and Heavy Work.*

ROBERT HENDERSON, CHAIRMAN.

The committee to whom was referred the consideration of the best kind of tuyere irons for light and heavy work beg leave to submit the following: We do not come before this convention with the idea that we have the best kind of a tuyere iron, but will endeavor to bring this important subject before you in a manner that we hope will secure your approval and obtain some good results. We are located in various sections of a large country, and all do not have control of a large shop and come in contact with something new every day. We do not have a chance to counsel with others who are better informed, but have to rely on our own resources; consequently the annual meeting of this Association is of great benefit to many of us.

The tuyere iron is a very important factor in successful blacksmithing. In the heating of iron, a good clean heat is necessary if you expect to obtain good results. Time and material are often wasted on account of a poor heat. If you should be obliged to use the old style tuyere iron, blowing into one side of the fire, the results would be very unsatisfactory, as the fire will heat quicker on the side nearest to the tuyere iron, and the result will be an uneven heat. With two pieces of iron in the fire at the same time, one will be hot before the other and there will be no certainty of a perfect weld; hence an increase in the trials and unnecessary labor of the smith. Therefore it is the judgment of the committee that the side blast tuyere iron should be a thing of the past.

We would recommend a bottom blast for either light or heavy work, as it produces a uniform heat, regardless of the length or width of the same, and an even heat is assured at all times. Our past experience would lead us to recommend a blast box 6x6 inches, and 9 inches deep, for heavy work, with drop grate on top in accordance with the accompanying drawing. The top of the box should be 12 inches below the top of the forge, as this depth gives you a good body of fire under the heat. It is to be understood, however, that the size of

the box and the depth of the fire may be increased according to the class of work to be performed. The blast pipe leading into the box should be from 3½ to 4 inches. The bottom of the box is provided with a slide for cleaning out the fire, which is accomplished with ease and without loss of time. For lighter work we would recommend a smaller box, 5x5 inches, and 8 inches deep, with top of the box ten inches below the top of the forge, and a 3-inch blast pipe. A box of this size will meet all the requirements of light or medium work. The drop bottom gives better results, in connection with some classes of work, than the one equipped with slide bottom. We would recommend that boxes and grates be made of cast iron in preference to wrought iron or steel, as the cast iron box can be made much cheaper and will not corrode as quickly.

In case the forge is built up from the shop floor, an ash box should be made of old boiler plate, 12 by 12 by 25 inches, with hole in the top and placed in the bottom of the forge low enough to allow the blast box to project through top of the same, and have sufficient room to operate the slide.

With regard to the economy of the bottom blast tuyere iron, as compared with one having the side blast, I will say that in getting a quicker, better and surer heat, you save a great deal of fuel, in addition to the amount saved in cleaning the fire, as the bank of the fire is not disturbed or broken up while clearing out the ashes. This method when compared with the old method of using a fire shovel, saves at least ten minutes every time it becomes necessary to clean the fire.

* Report read at the N. R. M. B. A. Convention at Buffalo.

The Progressive Smith as a Business Man.—4.

BILLY BUNTZ.

The Blacksmith's Invoice.

The shrewd smith studies his customers and handles them individually, taking into consideration who his customer is, what he does for a livelihood, his standing in the community, and so on.

Harrison H. Smith *Dr.*

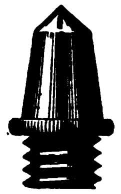
TO

WILLIAM JACKSON,

Expert Horse Shoer,

Established in 1880. *MUNCIE, IND.*

I have made shoeing a study as well as a business and guarantee an absolutely perfect fit.



I put on Never-slip Calks for my customers—guarantee them too. They never do slip

June 10, 1908.

4 No. 6 Shoes,	$ 1	50
Clipping "Fannie,"	1	00
	2	50

Customers are requested to pay their bills within thirty days. After that time unpaid bills are placed in attorney's hands.

While a Christian is a Christian, a rich man oftentimes generous, a gambler usually "a good fellow," a farmer well-meaning, a laborer generally honest—yet in a business way, when it comes to matters of credit or cash, a so-called Christian might "beat around the bush" as hard as anybody, as the application of Christianity depends considerably on whose head it's in. Many a rich man will squeeze the eagle on a dollar until it "screeches." A gambler may pay when he "makes a haul." A farmer may be burdened by owing for his farm. A laborer may mean all right, yet never be able to save the amount of the bill.

In extending credit to customers whom he knows to be worthy, the smith will find it business-like to give them an invoice itemizing the work which has been done for them, as a well-worded and neatly printed invoice is sure to impress them favorably by making them feel that they have been shown special attention, while if it be made attractive by his illustrated business card it will likely be preserved for future reference.

Sample invoices 1 and 2 have several meritorious business features, one being the special advertisement which renders them stylishly attractive. The more ways the smith has for appealing to his customers in matters of business, as well as in performing their work according to their whims, the greater will be his success.

From the samples it will be observed that the *writing* is mostly in *printing*, only the name, date and item of repair being written, hence very little time is required in filling out the invoice. These invoices need not be larger than 5 inches by 7 inches. By seeing these samples any printer can readily set up a neat one, inserting such wording as the smith's individual shop may require; at the same time the smith may run his illustrated business card in the newspaper. The advantages of using it on a letterhead will be dwelt upon in the next number of The American Blacksmith.

Sample No. 1 is a combined invoice, collection notice and advertisement. Even though the smith may never force the collection of small debts by action at law, on account of the expense attendant upon legal procedure, yet it is business for him to allow his customers to *think he would do so*, under the plan that a man is persuaded *through his head* much the same as a horse is guided by a bridle. The smith himself should specify the terms, rather than to allow his customers to dictate when they will pay. It is simply studying human nature to anticipate what a debtor might do under certain circumstances, and therefore he gives him proper treatment in advance. Even a reliable debtor might forget to pay, were he allowed to believe the smith "easy of credit" or dilatory in collecting a bill; hence the admonition that bills are placed in attorney's

John E. Gray *Dr.*

TO

W. E. DONALDSON,

BLACKSMITH,

PORTAGE CITY, WISCONSIN.

Shop driven by power, insuring prompt handling of jobs. All kinds of repairing neatly executed.

I am the agent for this engine. See how nicely the one in my shop runs. Can furnish any size and will set it up free.

December 5, 1908.

Resetting Axle,	$ 1	50
Fifth Wheel,	2	00
	3	50
Second-hand Buggy,	10	00
	13	50

Portage City, Wis., Dec. 5, 1908.

Sixty days after date I promise to pay to the order of W. E. Donaldson, Thirteen Dollars and Fifty cents, with interest at ten per cent; value received as per above invoice.

I guarantee payment: JOHN E. GRAY.

S. W. Darmon.

hands is likely to forestall tardiness.

Sample No. 2 is used where the bill amounts to several dollars and the smith wishes to realize cash although his customer asks credit. A little "molasses" should be administered in getting the customer to sign, after which he should be induced to hunt up a surety to guarantee payment, which makes the paper gilt-edged and cashable at the bank.

"See that book!" the smith may exclaim to a would-be debtor, opening his day book at a "salted" page showing a large amount of money owing him. Having impressed his customer, the smith continues.

"You can see that just now I need money to live on. However, I can give you time on your guaranteed note."

Where the smith does work on the assumption that the cash will be forthcoming, but is surprised by the customer saying, "I'll pay you later," he should "corner" him.

"You know I don't doubt your credit," he may say, in a low, confidential tone, "but business has been dull and folks are pressing me for money, so I must have cash or paper I can discount at the bank."

The debtor may try to hedge, but the smith should point his finger at him and not allow him to get in a word edgewise.

"Now, I know you don't want to see me forced to make an assignment—you've always been a good friend."

Then the smith quickly hands him the pencil and the note. Should he refuse to sign he may "jump the debt," therefore the smith should keep at his heels until he gets something out of him. Where a debtor is dunned every day he soon tires. Sometimes a man's wages or an account owing him may be garnished by the smith, although it is best to take whatever he can get rather than to force a debtor by law to pay a small debt.

The smith may use other wording on his invoice, warning his debtors what will become of them should they be neglectful.

Altogether it is business-like to handle customers by giving them an invoice or bill.

(To be continued.)

Table of Tools and Parts Made from Crucible Steel.

Giving Percentage of Carbon They Should Contain, Temper Colors to Which They Should be Drawn and Degrees of Heat for Producing Different Temper Colors.

COMPILED AND ARRANGED BY JOSEPH V. WOODWORTH.

Tool.	Caron, Per Cent.	Color.	Deg. of Heat. F.
Augers	0.70 to 0.80	Light purple	530
Axes	1.15	Dark purple	550
Arbors	1.05 to 1.10	Brown yellow.	500
Bone-cutting tools	0.80 to 1.00	Very pale yellow	430
Boring cutters	1.20 to 1.25	Straw yellow	460
Butt mills for brass	1.20 to 1.25	Very light yellow	420
Burnishers	1.22 to 1.25	Very light yellow	420
Bending and forming dies	0.90 to 1.00	Dark yellow.	490
Ball bearings	1.20	Very light yellow	420
Ball bearing plates	1.15	Very pale yellow	430
Barrels, gun	0.60 to 0.70	Blue	545
Bits, auger.	0.70 to 0.80	Light purple	530
Bits, axe.	1.10 to 1.15	Dark purple	550
Bits, channeling machine	1.15	Straw yellow	460
Bits, jointer	1.20	Straw yellow	460
Bits, mining.	0.80	Brown yellow	500
Bits, saw	0.80	Brown yellow	500
Bits, scarf	1.22	Straw yellow	460
Bits, tong	1.15	Brown yellow	500
Bits, for stone drilling	0.80 to 0.64	Brown yellow	500
Bits, well	0.80 to 0.84	Brown yellow	500
Bits, plier	1.00 to 1.10	Dark purple	550
Blade, knife	1.15	Straw yellow	460
Blade, pocket	0.90	Brown yellow	500
Blade, reamer	1.20 to 1.22	Straw yellow	460
Bushing, reamer	0.80	Dark yellow	490
Broaches	1.15 to 1.20	Straw yellow	460
Carver, blades	1.00 to 1.10	Dark yellow	490
Cams with sharp corners	1.15	Very dark blue	601
Centers, lathe	0.80 to 0.90	Dark yellow.	490
Chasers	1.15 to 1.22	Straw yellow	460
Chisels for wood	1.20 to 1.22	Spotted red-brown	510
Chisels for cutting files	1.20	Light yellow	440
Chisels, clay	0.80 to 0.90	Blue	545
Chisels, for hot work	0.60 to 0.70	Blue	545
Chisels, railroad track	0.85	Dark purple	550
Chisels, blacksmiths' cold	0.85	Dark yellow	490
Chisels, stone cutters'	0.80 to 0.85	Dark purple	550
Chisels, brick	0.60 to 0.70	Dark purple	550
Chuck jaws	1.20	Dark yellow	490
Circular saws for metal	1.60	Light purple	530
Claw bars	0.65 to 0.75	Light purple	530
Cold chisels for steel	1.20	Light purple	530
Cold chisels for cast iron	1.05	Dark purple	550
Cold chisels for wrought iron	1.10	Light purple	530
Collets	1.20	Dark yellow	490
Coppersmiths' tools	0.95 to 1.05	Light purple	530
Cutters, flue	1.20 to 1.25	Dark yellow	490
Cutters, glass	1.20 to 1.25	Light yellow	440
Cutters, milling	1.20 to 1.25	Straw yellow	460
Cutters, nail.	1.20 to 1.25	Dark yellow	490
Cutters, corn stalk.	0.80 to 1.00	Straw yellow	460
Cutters, pipe	1.18 to 1.20	Dark yellow	490

Tool.	Carbon. Per Cent.	Color.	Deg. of Heat. F.
Cutters, tong	1.20 to 1.22	Dark yellow	490
Cutting tools for iron	1.05	Light yellow	440
Dental and Surgical instruments	1.22 to 1.25	Light purple	530
Dies, bolt	0.60 to 0.70	Brown yellow	500
Dies, blanking (bottom dies)	0.85 to 0.90	Straw yellow	460
Dies, cartridge shell	1.20 to 1.22	Very light yellow	420
Dies, cutlery	0.60 to 0.85	Brown yellow	500
Dies, drop forging	0.85 to 0.90	Brown yellow	500
Dies, drop forging, for knives	0.68 to 0.78	Dark yellow	490
Dies, envelope	1.15	Straw yellow	460
Dies, for pointing machine	1.15	Very pale yellow	430
Dies, glove	0.85 to 0.90	Dark purple.	550
Dies, hammer	0.67 to 0.78	Very pale yellow	430
Dies, horseshoe (cold punching)	1.20 to 1.22	Straw yellow	460
Dies, large cutting	1.15	Straw yellow	460
Dies, large press forging	1.10	Dark yellow	190
Dies, lever link	0.85 to 0.90	Brown yellow	500
Dies, nail	1.15	Straw yellow	460
Dies, paper cutting	1.15	Pale yellow	430
Dies, pipe	1.15 to 1.22	Straw yellow	460
Dies, rivet	0.60 to 0.70	Dark purple	550
Dies, silver spoon	0.85 to 0.90	Straw yellow	460
Dies, silversmiths'	1.15	Dark yellow	490
Dies, tong	1.10 to 1.18	Dark yellow	490
Dies, wire drawing	1.20 to 1.22	Straw yellow	460
Drawing mandrels	1.20	Very light yellow	420
Drifts	1.20 to 1.25	Brown yellow	500
Drills for tool steel	1.15 to 1.20	Straw yellow	460
Drills for boring shotgun barrels	1.10	Dark yellow	490
Drills for glass	1.22 to 1.25	Tinge of yellow	410
Drills, quarry	1.10 to 1.18	Light purple	530
Drills, twist	1.20 to 1.22	Straw yellow	460
Driver, screw	0.60 to 0.70	Dark purple	550
Drills for brass	1.22	Straw yellow	460
Edging cutters	1.15	Light purple	530
Embossing dies	1.22	Light yellow	440
Firmer chisels	0.90 to 0.95	Dark purple.	550
Flat drills for brass	1.20 to 1.25	Brown yellow	500
Flat drills for steel and iron	1.15	Straw yellow	460
Flatters	0.60 to 0.70	Brown yellow	500
Framing chisels	1.05	Dark purple.	500
Gauges	1.05 to 1.15	Brown yellow	500
Gimlets	0.85 to 0.95	Dark purple	550
Grips for tube work	0.85 to 0.90	Dark purple	550
Hack saws	1.05	Brown yellow	500
Hammer, bush	1.25 to 1.30	Brown yellow	500
Hammer, blacksmiths'.	0.67 to 0.78	Straw yellow	460
Hammer, bush for granite	1.15	Brown yellow	500
Hammer, ball peen	0.80 to 0.85	Straw yellow	460
Hammer, faces	1.05 to 1.10	Very pale yellow	430
Hammer, machinists'	0.90 to 1.00	Very light yellow	420
Hammer, nail machine.	1.05 to 1.10	Straw yellow	460

(To be continued.)

HEATS SPARKS WELDS

A bright New Year to the blacksmith.

How do you like our handsome calendar?

Be sincere in order to win the truest respect of people.

Down your way is business brisk? Keep your customers awake by advertising.

Now's the time to install system, and carefully note results through the whole year.

A good time to open up new side lines—now when business is lively and the year just new.

Many subscribers are taking advantage of the long time rates to pay their subscriptions several years ahead.

A cheery word goes a long ways in a care-worn world. Make it a rule to have a little sunshine always stored with you.

Don't forget the apprentice; you had to learn your trade once. Put yourself in his place, and lend him a helping hand occasionally.

The biggest mistake ever made by a business man is that of allowing accounts to stand—but this subject has been already talked threadbare.

Grit is the thing that counts. Brains, education, money, influence—all fail to help a man to success if he has not that force of character known as grit.

Large forge shops often sadly lack light and ventilation. Most up-to-date ones are installing systems that carry off all smoke. That improves the lighting too.

A lien law. Do you want one in your State? Will you do just a little to help the cause along? Read what is said about the Lien Law movement in this issue, then act.

Adaptability is the best possible substitute for ability. The man who is not capable of originating an idea may, at least, devote his time to carrying out the ideas of other men.

Grains of sand make up the ocean bed, but each grain is very small in itself. A few cents' advance in price on every piece of work done soon counts up to a nice round sum—absolute gain.

The best way is the one by which a thing is done as well as possible with the least expenditure of time and labor. No method is perfect that does not fulfill these conditions.

Standing room only is an appropriate sign for shoeing shops these slippery winter mornings. Horses standing round by the dozen waiting to be sharpened—busy times for the smith!

One asset of the expert mechanic is his store of experience. This he invests in the business, and should make it count in his profits. If he does not, that part of his capital is drawing no interest.

A customer knows what he wants done—or thinks he does. Never allow him to get the idea that you slight his opinion. Talk him out of his error, gently and tactfully. Time thus spent is not wasted.

Frozen out of the trade are many of the men who have worked for cheap John prices. This is cold weather to be out in, and the smith of any degree of wisdom will put up his prices rather than go out.

Hundreds of dollars are lost by countless blacksmiths every year because of bad debts and dead beats. Have you looked into the Lien Law matter and figured how much money it would save you?

Want a calendar? Then be sure your subscription is not in arrears. Not quite too late to tend to this and get the calendar Treat a subscription bill for your trade journal as you like to have others treat your bills.

Kindness and gentle treatment are the rule in breaking in horses now-a-days. Even on ranges the old cruel methods of breaking in horses are being abandoned. The damage done horses by severe methods is being realized by owners.

Good-natured rivalry is a good thing in any trade. No business that keeps up a lively competition can ever stagnate. Two blacksmiths in the same neighborhood, by a mutual understanding, can get up a competition that will prove a benefit to both.

Too much caution may get in the way of advancement. Some people are so afraid of new things—so cautious about accepting anything new—that they go through life in a rut. There's no harm in trying, and it is always possible to return to the old if the new proves unsatisfactory.

Snowed under with work is a state many blacksmiths get into during the rush season. It is bad policy to keep people waiting on you. A wise man will have tools and appliances to handle the maximum amount of work that may come at any time, and call in extra help if necessary.

Shoes that stay on too long are very injurious to a horse's feet. The hoof overgrows and leads to innumerable evils. Yet the smith is blamed if the shoes do not stay on long and is condemned when the horse's feet become lame from too long growth. This is a paradox that confronts the horseshoer.

Some of the best of our prize contest articles are published this month—not all. There so many excellent things about carriage and wagon work in the articles received, that we shall continue to publish them for several months to come. Practical information, all of it—don't miss a single article.

A good fighter is worthy of admiration, and he gets it. The man who stands and meekly takes whatever comes his way is likely to get just what he doesn't want. What's more, the very people from whom he takes it will say he has no grit. The blacksmith, like everybody else now-a-days, must fight for his rights.

As an example of what others think of THE AMERICAN BLACKSMITH, it may be mentioned that within the last ten days no less than twenty-one clubs of subscribers to the paper have been sent in to this office, ranging in size from five subscriptions apiece up. Blacksmiths can do their brother craftsmen a good service by calling their attention to THE AMERICAN BLACKSMITH.

Don't lose faith in your own work. Always believe that you can and will accomplish something in the world. This feeling inspires others and their opinion of you goes up. "Give a dog a bad name and hang him—"is a proverb that works both ways. Give a man a good reputation and with a little care it will last him as long as he wants it. Every man's reputation lies in his own hands.

The old proverb that "honesty is the best policy" is a good one at all times. The step from meanness to absolute dishonesty is so short that the man who is capable of small acts very readily develops into a dishonest man. A reputation for open-handed integrity is worth many times the amount that may be added to the income of a business man by twisting a principle to fit his own gain.

A true balance of work and play is the only sure means of making the best of life. The man who overworks is using energy that belongs to the future, and the time will come when he will find himself bankrupt, mentally or physically, with no satisfaction, either of having seized any pleasure while he was able to enjoy it. On the other hand, the man who idles his time away never develops his best faculties nor his capacity for enjoying well-earned recreation.

A Bugbear—Is that your opinion of a system of books? Many smiths think thus, and there is some reason behind it. A system of any kind should have for its object the simplification of business, and is only useful where it fills this bill. A plain, practical set of books, containing all necessary information and no unnecessary complications cannot but help any business man, first, by saving time in hunting up and reckoning accounts, secondly, by saving endless worry, and thirdly by giving an air of business to the establishment and inspiring confidence in customers.

Cinder in the eye is a common ailment with the man at the forge, but the average smith knows how to get rid of it. A far more wide-spread complaint, and a more fatal one is the total lack of foresight which the average blacksmith exhibits. Instead of taking steps to combine for his own interests, he plods along, cutting his neighbors' prices and his own income. Instead of being brother craftsmen, standing shoulder to shoulder to meet the high living expenses, they become rival craftsmen ready to tear one another to pieces—in reputation at any rate. Such smiths are totally blind to their own interests.

For defective hoofs, a remedy, says a contemporary, is a compound of gutta percha cut into pieces the size of a hazelnut and mixed with an equal proportion of gum ammoniacum and melted in a vessel of tinned iron until thoroughly mixed. The substance then has the color and appearance of chocolate. It can be softened and moulded to any form and applied to the hoof, to which it sticks firmly. Too low a wall may be built up with this artificial horn, or lost portions restored. In sand cracks it closes up the orifice and keeps out dirt. For dropped sole, to raise the bearing surface of the wall in seedy toe, or when the frog is atrophied, this substance is useful.

Tom Tardy was thoughtfully scratching his head when we dropped in the other day to wish our worthy friend the compliments of the season. "Thet there hoss has well nigh drove me crazy. What's the matter? Matter enough. The darned old critter have just made up her mind to cut herself spite o' everything. I have shod her high in front and high behind, high on the outside, high on the inside, heavy outside and heavy inside, and each time she hits worse 'an ever. Tried all the ways I knows on, but ain't no use. Why don't I look for the cause? Don't know as there is any cause. Just hits anyhow."

We asked Tom why he didn't get some books or take good papers and read up.—"I don't take no stock in books—never was much on reading nohow."

American Association of Blacksmiths and Horseshoers.

Movements of far-reaching Importance.

It is gratifying to be able to report substantial progress towards the ends for which the above association was formed. Every blacksmith, horseshoer and wagon maker, who has his own personal advancement at heart, who thinks that his skill and labor ought to bring him more of the comforts of life, or who is interested in bettering the conditions of his craft as a whole, every such mechanic should follow closely the efforts of The American Association to bring about some much-needed reforms. Further than this, every craftsman should give his earnest sympathy and support, because the work is being done in his interest, and will be of the greatest benefit to him if successful.

State Lien Laws.

The efforts which have been made for some time past by the Association to secure State Lien Laws for blacksmiths and wagon builders are at last beginning to bear fruit. At the next session of the legislature in a number of States a lien law bill will be introduced. This bill has been carefully prepared by the American Association, in conjunction with its attorneys. As drafted, it provides that any blacksmith or wheelwright who has furnished materials or labor in shoeing an animal or repairing a vehicle may file a lien which will hold the animal or vehicle as security to satisfy his claim against the owner. The lien may be filed at any time within six months of the last item of the account and may cover a period of eighteen months' work.

Think how much money such a law in your State would add to your income yearly. It would be worth from one to four hundred dollars to you to be able to collect all the money you earned, that you now lose, and it would enable you to take work unhesitatingly from men that you don't feel like trusting now.

LOU DILLON.

THE FIRST HORSE TO TROT A MILE IN TWO MINUTES. RECORD MADE AT READVILLE, MASS., AUGUST 24, 1903.

Will you support the lien law movement in your State and do your part to get the bill passed? Your aid will count, and it is needed, and best of all not a penny's contribution is asked of you. Write to The American Association or THE AMERICAN BLACKSMITH at Buffalo, N. Y., and you will be told what you can do in your State to help the good work and aid in securing this much-needed legislation.

The New York State Lien Law Bill.

Senator George A. Davis, of Lancaster, N. Y., early in December personally assured a representative of The American Association that he would attend to the introduction of our lien law bill early at the coming session of the New York State legislature and would use his earnest efforts to secure its passage. The American Association and The AMERICAN BLACKSMITH will do everything that is possible to aid the good cause. It will be necessary to have the aid, however, of the craft for whose benefit it is intended. Not much is asked, but every one should do the little that is asked and do it at once. We must leave no stone unturned to get the law passed.

Let every single blacksmith, horseshoer and wagon maker in New York State, whose eye meets these words, remember what a great thing such a law would mean for him, and then let him sit down and write a short, strong letter to his representatives in the State legislature, urging and requesting them to vote in favor of the bill when it comes to a vote. If by any possible chance these Senators and Assemblymen can be seen personally, then by all means call upon them, either alone or with your brother smiths, and urge them to give their vote for the lien law bill. New York State smiths should also spread the news of the bill to as many of their brothers and neighbors as they can possibly write to or call upon, and have them do the same thing. Get every one of the craft in the State interested and working for the bill, and it should be a law within a very few months. If you are a New York State blacksmith or wagon man, and if you think the money you now lose on bad debts is worth saving, then do *at once* the little that is thus asked of you. Write the letters and make the calls the very day you read this.

Those in other States who are interested in this lien law movement and realize the saving it would mean for them, should drop a postal, to-day if possible, for further information, addressing The American Association of Blacksmiths and Horseshoers, and they will write to you in detail.

Movement for Better Prices.

Under the auspices of The American Association, blacksmiths and wagon builders in numbers of counties in many different States are now engaged in forming themselves into associations for mutual advantage, better prices and other benefits. They are organizing according to plans furnished by The American Association, and encouraging reports as to the progress of the work in new districts and the success of county associations already formed, are constantly coming in. We would like to see every single county in each State organized, and are only too ready to

lend our assistance. Owing to lack of space a fuller description of the better-

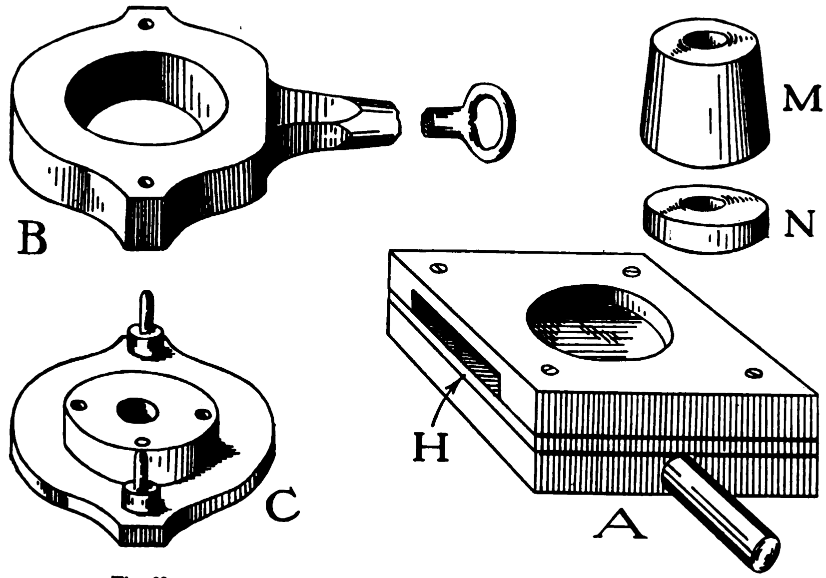


Fig. 60. TOOLS FOR PUNCHING OUT DIFFERENT SIZES OF WASHERS.

price movement will have to be postponed until next month's issue of THE AMERICAN BLACKSMITH.

The Railroad Blacksmith Shop.—15.

W. B. REID.

Tools in the Blacksmith Shop.

A set of round punching tools for different sizes of washers will be found very useful in the blacksmith shop. They may be made entirely of mild steel, or if available, cast steel plates as shown at H, Fig. 60, rivetted between top and bottom parts of iron, make very durable tools; especially where many mild steel washers have to be punched. M is the punch; N the bottom plate, used when the hole in centre of washer has to be punched. The holes in the punch and plate should be as large as possible. This permits the punching of different sizes of holes in washers, by the insertion of improvised close fitting bushings of steel boiler plate, or ones more substantially finished by machine.

At B, Fig. 60, is shown a cutting tool for the larger sized crank-pin washers 6½ to 7½ inches in diameter. The shape of this tool is incidental to the fact of its being made from the end, or head, of an old, steel side-rod. The handle is drawn down from part of the centre of rod. The two oil cup projectors upon the sides serve naturally for the dowell pin holes. The punch C, Fig. 60, is made in two parts. The larger plate of iron, with a steel disk of sufficient thickness rivetted to it. The dowell pins are turned with small collars, as shown, to prevent the punch from descending too far beneath the necessary shearing point. When cutting crank-pin washers with hubs, or bosses upon them, a plate with hole as large as the boss fits into bottom of tool, (B, Fig. 60). This acts as a guide to hold the boss of washer central with its outer circumference. This plate is allowed to drop out when the punching process is half completed.

Spring gibs or keys are articles of constant requirement in the railroad blacksmith shop. At A, Fig. 61, is shown a large gib 4″x2½″x⅞″ used on heavy engines. These are stamped out in a tool of similar construction to A, Fig. 60. B and C, Fig. 61, are the cutting tool and punch used. From five to eight pieces can be punched from the bar in one heat with this tool. At D, Fig. 61, are shown the swedges for rounding the edges of a gib. The swedges are turned out to show their construction.

At F and H, Fig. 62, is shown a tool for putting hanger slot in gib, after being rounded in the swedge. The sectional view of this tool will show its construction and operation (E, Fig. 62). The small cast steel pin, G, fits tightly in bottom of F, projecting upward as shown in section, and intercepts the gib when forced downward by the blow of hammer, thereby forming the slot in gib. By this method an exceptionally well formed gib is made.

With regard to eye-bending devices a tool of this kind for turning round eyes is probably an easier proposition than one for forming perfect ovals, such as are desirable for making handles for locomotive fireman's rakes, hoes, etc.

At Fig. 63, is shown a hand tool for this purpose, which works admirably, although probably of an odd, unusual style.

The sketch shows a plate 20″x18″x1″ to which the handle former A, and the backstop opposite N are rivetted. The lever B is held permanently in place, and revolves upon a pin with nut on top as shown. The pin in point of lever C is rivetted in the lever itself to permit the removal and placement of the lever as required.

The movements of the levers are shown by the dotted lines in sketch. At M, the lever B is at first position, with the rod also in position for bending. A movement to the left forms the half bend in long end of rod. Releasing the lever the piece N is slipped in place, thus holding the iron against the backstop, while the lever is swung around to position X, carrying the iron with it. The lever is held here, by a pin inserted in hole shown at corner of plate. Then the lever C is put in place at Y, and carried around to position C,

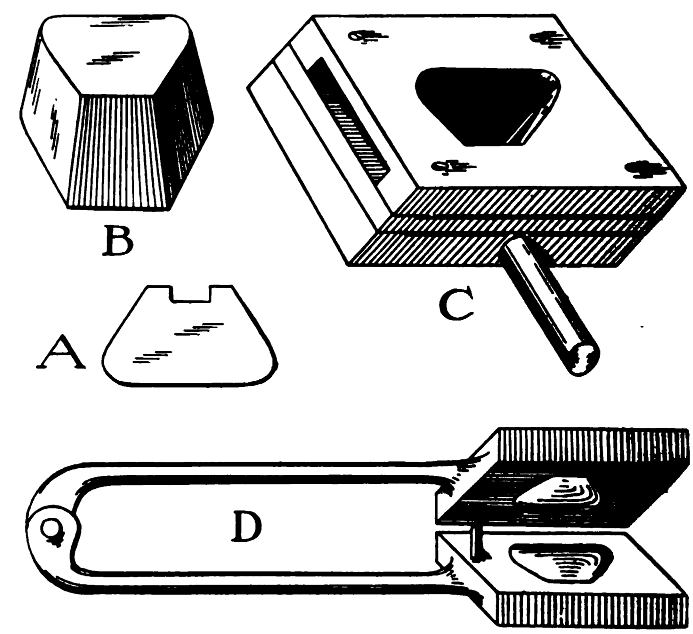


Fig. 61. STAMPING OUT, AND ROUNDING EDGES OF GIBS.

completing the operation. The handle is then slipped easily off the "former," which is tapered upward.

The levers are 1¼ inches thick at the working parts, tapered to ⅞ inch at the

ends. When in use the tool is bolted to a face plate convenient to small furnace in which the rods are heated. Two men can form eighty ⅜-inch handles in an hour, with this humble machine.

In closing the subject of tools, we trust enough has been shown to demonstrate the possibilities of facilitating the work of the blacksmith shop by means reasonably within reach of all. The adaptability of such contrivances need only be limited by the requirements, and as said at the outset, by the ingenuity and resourcefulness of the blacksmith. To the small, average railroad shop, such tools will prove invaluable. To the larger and better equipped shop, much has been said that will prove valuable. In making tools and appliances for every other department, the blacksmith foreman too often thinks he has not time to make tools for himself. This is generally a mistake. In the busiest shops, it will pay to reserve a good man for making and repairing tools for the blacksmith shop.

(*The end.*)

Prices in the Oil and Gas Belt of Southeastern Kansas.

ED LANDER.

Wagon tongue put in	2.25
Buggy pole	2.25
Circle put in	$0.75 to 1.25
New shaft	1.00 to 1.25
Crossbar	65 to .75
Singletrees	35 to .50
Wagon axles	2.50
Bolsters, old irons put on	1.25
Sand boards, old irons put on	1.25
Bow sockets	.50
Buggy or spring wagon beds, $5.00 and up.	

Steel and How to Treat It.—8.

JOSEPH V. WOODWORTH.

Effects of Uneven Heat.—Lead Heating.—Quenching.

To demonstrate the effects of uneven heating in hardening we shall take as an example the cutter blade shown in the sketch, and harden it. We shall have to handle it while in the fire so that the thinnest portions will not reach the hardening heat before the thick portions. If this is not done, the tool will come through the process bent or warped; this coming about, not through the difference of temperature of the different portions, but through the more solid parts being too strong to permit expansion; and when expansion is at length accommodated it has been at the expense of the thin or frail portions.

In the second figure we have a die that is much thinner on one side than on the other. We take this to harden and heat it between the thin and the thick sides to a cherry red; while the sides are barely red hot and the center a cherry red, the latter will be the weakest, and will give way most to accommodate the expansion, as the strength due to its sectional area has been overcome through the reduction in strength due to its increased temperature. Thus the

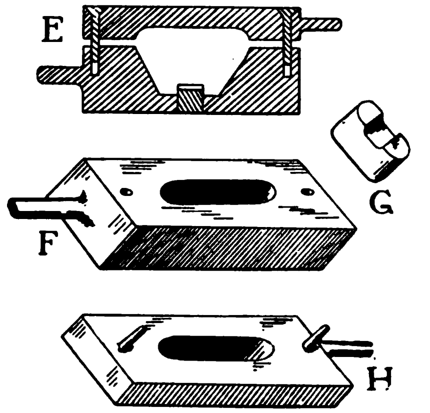


Fig. 62. PUTTING HANGER SLOT IN GIB AFTER BEING ROUNDED IN THE SWEDGE.

necessity of heating a tool according to its shape and size is obvious, and the aim should be to heat it evenly, all over, taking special care not to get the thin parts hot first.

When a large tool is to be hardened the thin parts may be covered partly during the first heating with ashes. However, when the piece is of equal section area all over, it will be necessary to manipulate it in the fire to get the uniform heat all over. In both cases care must be taken not to heat the steel too quickly, unless it is wished to leave

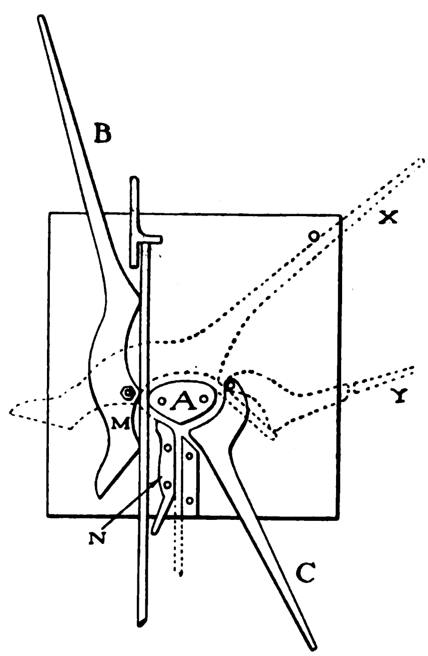


Fig. 63. A GOOD, SERVICEABLE EYE-BENDING DEVICE.

a soft core in the center, which is often desired in tools. Often the outside of tools are heated more than the inside so as to modify the tendency to crack from contraction during the cooling.

An important factor in heating steel in the open fire for hardening is the size of the piece. This is because decarbonization occurs, and the smaller the sectional area of the tool the quicker the decarbonization takes place. In large pieces and tools the decarbonization from one heat will not be sufficient to hurt the steel much, but if the tool has to be heated often the constant reheating will surely spoil it. To prevent decarbonization in the open fire, charcoal is often used, and when there is much hardening done it is good practice, as a few pieces of charcoal can be placed on the fire at a moment's notice. Green coal should never be used for heating for hardening; a coke suitable for the process should be made and always kept on hand. To make the coke, build a large fire of small soft coal well wetted and banked up on the fire, and then make vents for the blast to find egress. When the gas is out of the center and the coal has caked, break it up in chunks and burn the gas out of the outside. Place the coke where it will be handy for use. Good blacksmiths always keep a supply of the coke on hand and use it for welding and annealing heats as well as hardening ones.

There is a large class of work which can be best heated for hardening in red-hot lead. It is a very rapid and satisfactory method for all small tools and parts. What makes the lead particularly valuable for heating accurately small parts is that a uniform heat can be applied without danger of burning or scaling the outside before the center is heated.

When heating in lead a graphite crucible placed so that a uniform heat will be maintained beneath and around the pot will prove the best. As to the lead to use, care must be taken to get a brand with as little sulphur in it as possible. Never use scrap lead, as it will ruin the steel. Chemically pure lead should always be used.

There are a great many compounds in use to prevent the lead from sticking to the work. One of the best is following: One pound of powdered cyanide of potassium dissolved in one gallon of boiling water; allow to cool, and then dip the articles to be heated in the solution, remove and allow to dry thoroughly before putting them into the lead. Moisture will make the lead fly.

Small articles of an even size and thickness throughout can be put into the lead cold, while irregular pieces must be heated nearly red before put-

ting into the lead, in order to prevent unequal expansion.

By keeping the surface of the lead covered with broken charcoal, drops will be prevented from forming. After the heating has been concluded, empty the crucible.

To get good results when hardening in lead, stir the liquid occasionally so as to equalize the heat, as the bottom will always be hotter than the top. When tools or parts with fine projections or teeth are heated, use a stiff brush and clean off any particles of lead which may stick in them before quenching. This is necessary, for steel will not harden where lead has stuck to it, as the spots do not come in contact with the bath.

Very often the steel worker is confronted with a piece with a hole in the center that is required to be hard around the outside and soft around the hole, or a punch is required to be hard at both ends and soft in the center. To accomplish these results with ease use clay in the following manner: When the stock around the hole it to be left soft and the outer edges of the piece hardened, fill the hole with clay and pad it at both sides, then heat the piece and plunge it into the water. When cool, remove the clay and the stock around the hole will be found to be soft while the edges will be as hard as required. To harden both ends of a punch and leave the center soft, put a bandage of clay around the center, or desired soft portion about ⅜ of an inch thick, and bind it with a piece of thin sheet metal. Heat and quench, and the desired result will be accomplished.

When hardening die plates or other tools in which there are holes near the edges, fill them with clay before heating and the tendency to crack will be overcome. When the holes are not filled with clay (when the steel is quenched) steam generates in the holes and cracks start, or excessive warping occurs, due to the fact that the steam does not escape fast enough and the contraction of the metal is unequal.

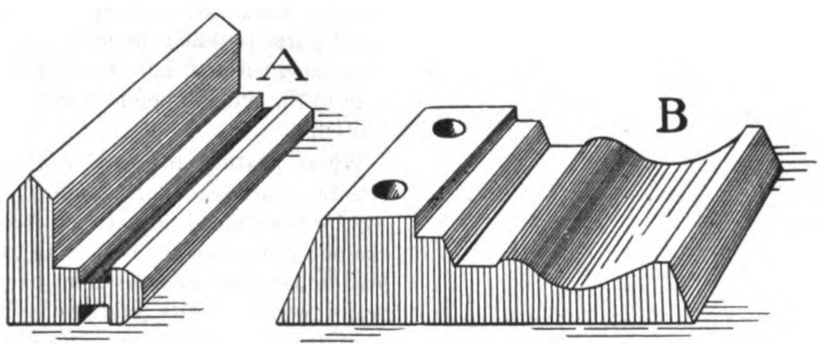
Next to the proper heating, more depends upon the proper quenching than anything else. Of course the effect, use and good qualities of the various kinds of baths should be understood. The most generally used bath is cold water, though not infrequently salt is added or a strong brine is used. The following will be found to answer well for the work mentioned. For very thin and delicate parts, an oil bath should be used for quenching. For small parts, which are required to be very hard, a solution composed of about a pound of citric acid crystals dissolved in a gallon of water will do. For hardening springs, sperm oil; and for cutting tools, raw linseed oil will prove excellent.

Boiled water has often proved the only bath to give good results in a large variety of work, the parts requiring hardening being heated in a closed box or tube to a low red heat and then quenched. Sometimes the water should be boiling, at others quite hot, and then again lukewarm. Experience will teach the operator which is the best for special work. If a cutting tool such as a hollow mill, a spring threading die or a similar tool is to be hardened in a bath of this sort, dip it with the hole up, or the steam will prevent the liquid from entering the hole and leave the walls soft. A tendency to crack will also prevail if this is not done. The generation of steam must be considered when hardening work with holes or depressions in it, and attention must be paid to the dipping of the part so as to prevent the steam from crowding the water away. Clean water steams rapidly, while brine and the different solutions do not.

I have heard a great deal about hardening fluids, for which it is claimed tools can be hardened better than in water or in brine. Such fluids are composed chiefly of acids and will rot the steel, and I should advise keeping away from them, as where it is not possible to harden tool steel in clear water or strong brine, the steel is useless and should be dispensed with. When quenching the heated steel dip down straight and don't shake it about but after keeping it stationary for a few seconds, move it around slowly, keeping it vertical all the time. When the tool is of an intricate shape, about three inches of oil on the top of the water will toughen it and contribute to helping the steel retain its shape while hardening, as well as prevent it from warping or cracking during the process. Lastly, immediately after hardening and before tempering, the steel should be placed on the fire and slightly warmed, to take the chill and contraction strain out and not laid aside for a while, as I have seen tools that were laid aside after hardening, after a few hours, show cracks.

The cooling should be performed with a view to prevent the contraction of the metal from warping the weaker parts. Water for cooling must be kept clean, and in that case becomes better from use. It may be kept heated to about 100° F., which will diminish that risk of having the articles crock. Corners should be made as rounded as possible. If the water is very cold, and the heat hence extracted very rapidly from the outside, the liability to crack is increased; in many cases the water should be heated to nearly the boiling point, so as to retard the extraction of the heat. Since, however, the hardening of the steel is due to the rapid extraction of its heat, increasing the temperature of the water diminishes the hardness of the steel, and it is necessary to counteract this effect as far as possible, which is done by adding salt to the water.

All articles that are straight or of the proper form after leaving the fire should be dipped vertically and lowered steadily into the water; and if of weak section or liable to crack or warp, they should be held, quite still, and low down in the water until cooled quite through to the temperature of the water. If the article is taken from the water too soon, it will crack, and this is a common occurrence. Pieces of blade form should be dipped edgeways, the length of the article lying horizontally and the article lowered vertically, and held quite still, because by moving it laterally, the advancing side becomes cooled the quickest, and warping and cracking



EFFECTS OF EVEN (A) AND UNEVEN (B) HEATING IN HARDENING, OF IRREGULAR SHAPED PIECES.

may ensue. Straight cylindrical pieces should be dipped endwise and vertically. When, however, the dipping process is performed with a view to leaving a sufficient heat in the body of the article to draw to a lower temper the part dipped, the method of proceeding is slightly varied.

Often when tool steel is bought, special instructions will be given as to the method of hardening and tempering it. Sometimes these instructions are followed out, and oftener they are not. Now in all cases where such instructions are given, don't forget to go by them, otherwise do not buy that brand of steel; but instead secure a brand which you can harden as you think best. There are various brands of steel on the market which are used for a number of special purposes and which possess qualities which other brands do not (in regard to cutting at high speeds, removing large amounts of stock, etc.) which require hardening at special temperatures.

(*To be continued.*)

Power in the Shop.

BY B. W. B.

The question often arises in the mind of the blacksmith, whether to put power in his shop or not, and if so, what kind. The writer would like to give brother blacksmiths his experience and conclusions upon this important subject.

The matter of putting in power or not is in the same class as questions about putting in new tools and improving the shop equipment. Now anything which will enable a blacksmith to turn out more work adds just so much to his income, and no live shop ever hesitates about putting in a new tool which will mean more work, or better work commanding a higher price. The question simply is, will not the extra profit on such a tool pay for itself in a reasonable time, and from then on help make clear money for the smith?

And so it is with the power question. The amount of money which one man can make by his hand labor and skill has a limit. When a smith reaches this limit, where he can earn no more, no matter how hard, how long or how skillfully he works, then the only way for him is to resort to other means for turning out more work. The commonest, perhaps, is by putting helpers or other workmen in the shop on salary. Another way is by putting in power. With an engine, a man can accomplish far more, do better and heavier work, increase his income just as far as he can draw trade and provide the machines to turn it out. The cost of running an engine being but a small item, it only remains for the smith to figure out if the profit on the extra work that it makes possible would not in reasonable time pay for the machine. He should remember that such enterprise on his part draws trade, and that his business must either go forward or backward. An engine is a by step in advance. Blacksmiths in every part of the country are testifying to the advantages of power in the shop.

As to the kind of power, the writer thinks the vote overwhelmingly in favor of the gas engine. It is just an ideal power for the small shop. The reliable gas engines on the market to-day are simple, require little attention, are safe, take up little room, consume but little fuel and are complete in themselves. They can be started or stopped just when the smith needs the power, and are altogether the most satisfactory form of power for blacksmith or other small shops. The writer has never heard of a blacksmith, who wanted to do without power once he had put it in.

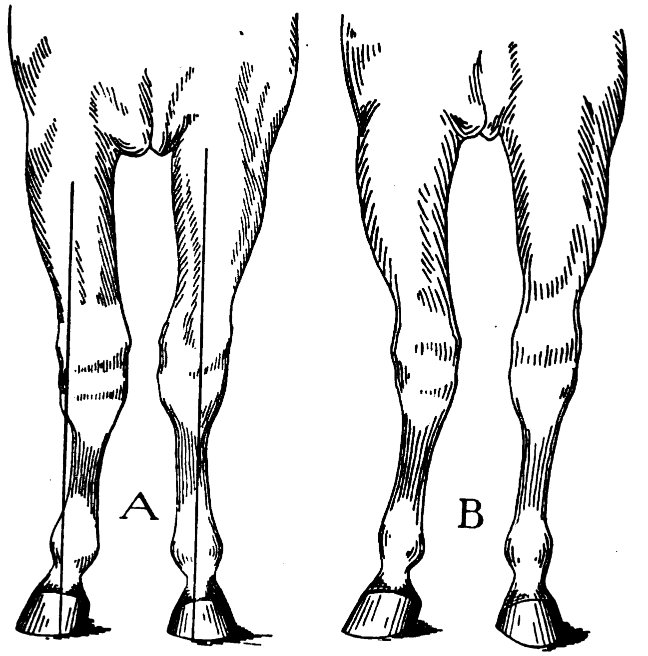


Fig 5. TWO EXAMPLES OF SHIN HITTERS. A—CALF-KNEED. B—CALF-KNEED, HAVING ONE FORE LEG SLIGHTLY TOE-WIDE.

The Practical Scientific Treatment of Interfering Horses.—2.

S. W. PERRIN.

Shin Hitters.

Shin hitting consists in the animal striking the cannon bone or shin with the opposite foot. The blow causes soreness, and sometimes lameness; usually only one leg is affected. Occasionally a horse hits the shin with one foot and the fetlock with the other. In shin hitting as with all other kinds of interfering, reason suggests a careful analysis of causes.

Causes:—The shin hitter has one or both legs toe-wide. It frequently happens that the calf-kneed horse is a shin hitter, see A, Fig. 5. I have three horses in Little Rock, each having one fore leg slightly toe-wide with its fellow toe-wide and calf-kneed, see B, Fig. 5; and all three horses are shin hitters.

Treatment:—Protect the injured part with a boot, until you know that your patient is going clear. Study your case very carefully with a view to ascertaining the cause; then endeavor to prepare the hoof to conform to the limb. With horses of the conformation corresponding to A, Fig. 5, the hoofs should be left high on the outside, and should be shod with shoe shown at A, Fig. 6, which has an outside weight. With horses of conformation corresponding to B, Fig. 5, the left foot should be high on the inside, with the outside quarter rolled, and use shoe

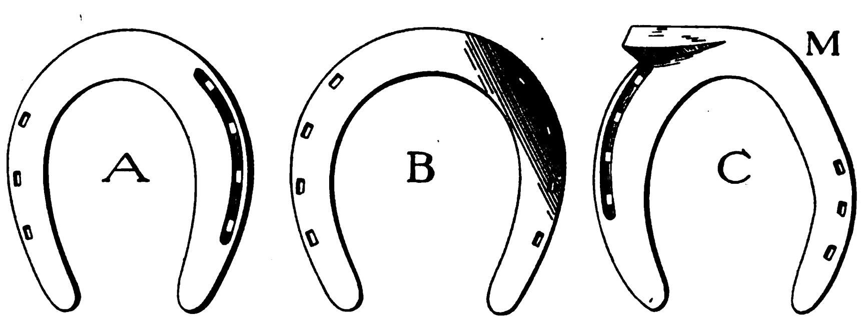


Fig. 6. EXCELLENT STYLES OF SHOES FOR PREVENTING SHIN HITTING.

shown at B, Fig. 6. And on the right foot leave the outside high and use shoe C, Fig. 6, fitted close between

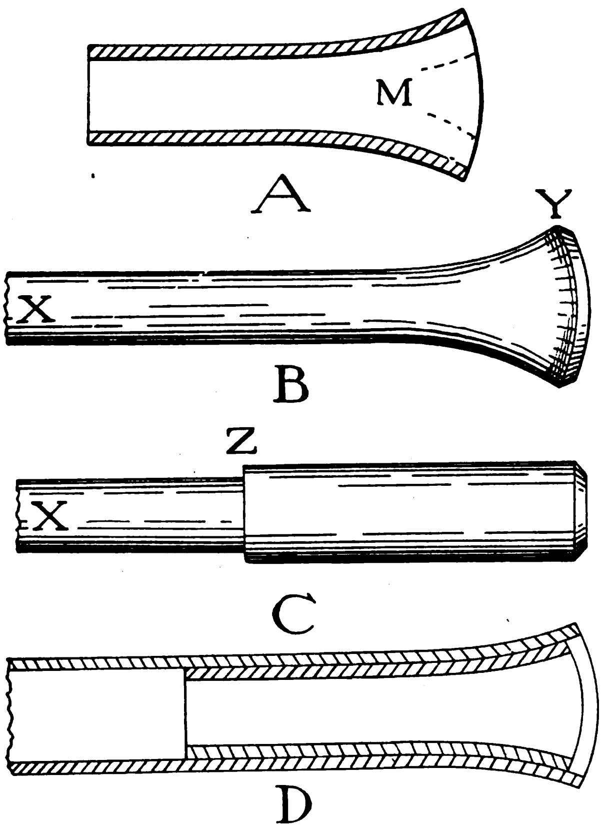


Fig. 1. WELDING AND SHAPING THE PARTS FOR SELF TURNING JARS.

M and N, at which point some of the outer wall may be rasped away.

It should be remembered that horses of such conformation as A and B, Fig. 5, travel dangerously close at best, and it takes but little to make them interfere. Even a corn, thrush in the frog, a splint, ring bone, or side bone, or any thing which causes pain in the foot or limb, may so interfere with the regular movement as to cause such horses to hit. And wherever there is pain in foot or limb, causing interfering, you can hardly hope to prevent it until the cause is removed. If you are in doubt as to conformation, (and I admit that it takes an accurate eye to detect differences in conformation of limbs) and your patient has plenty of hoof, take off the shoes, remove the sharp edge of the outer wall with the rasp, so as to leave a round edge that will not chip. Then use the horse for a few days without the shoes, taking care not to let him get foot sore; the hoofs should be watched closely each day to see that they are not chipping or wearing dangerously close. If the horse goes clear without the shoes, then shoe him with a light plain shoe, with only enough metal to protect his hoofs from wear. In this case *don't* level or rasp the ground surface of the hoof, but bend the shoe to that form which nature has worn the ground surface of the hoof, for if your horse goes clear without the shoes, he will with them, provided you do not change the shape of the plantar surface of the hoof, and do not burden the limb with too much weight.

(*To be continued.*)

Making a Pair of Self Turning Jars.

L. B. SWARTZ.

The following is my plan for making a pair of 5-inch self turning jars for drilling tools, to be used in a 5½-inch hole or larger. For building a pair of such jars the following stock will be required.

One taper joint (box and pin) 2 x 3 inches, standard size.

One piece hydraulic pipe 5 inches external diameter, 3½-inch base by 3 feet long.

Two pieces hydraulic pipe 3½ inches external diameter, 2-inch base by 9 inches long.

One piece mild steel shafting 2 inches or 1$\frac{5}{16}$ inches round by 33 inches long.

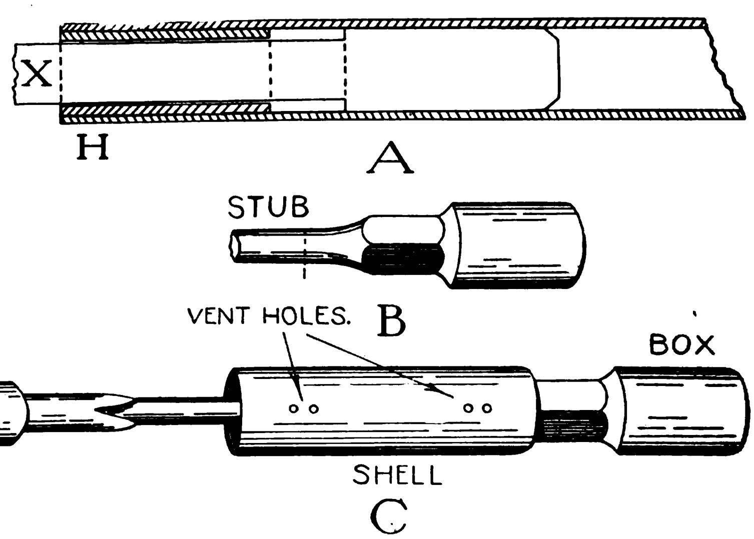
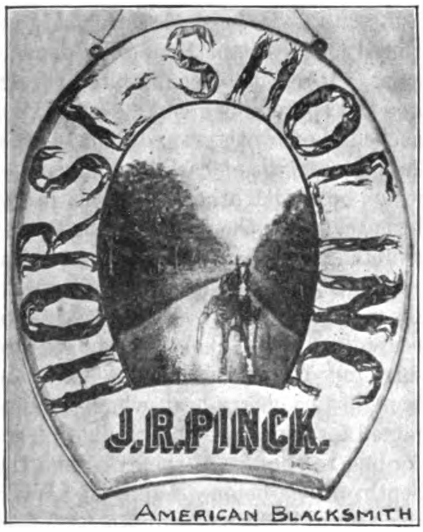


Fig. 2. THE JARS WHEN COMPLETED.

Having procured the stock, proceed to weld one of the short pieces of pipe on the steel shafting. In doing this it is best to upset the end of the shaft by taking a short heat and striking on the end so heated, also to flare out the end of the pipe to as near the same taper at the upset end of the shaft as convenient. If you should get the pipe flared a trifle too much, slit the end of pipe in three or four places as indicated by the dotted lines at M, Fig. 1. The pipe should not quite reach over the flared end of shaft when slipped over end (X, Fig. 1) of shaft, but reach the point Y within ¾ inches or so of the end.

Now heat both the pipe and shaft to about a welding heat and slip the pipe down over the shaft to within 4 or 5 inches of the upset end and raise to a good welding heat. Drive the pipe to place and dress down under a welding heat until the flare is drawn down to same size as the pipe above the flare, *i. e.*, 3½ inches. You have now made the piston of the jars. In finishing up, it is well to chamfer the end as shown (Fig. 1, C), but leave shoulder Z square. Next proceed to flare one end of the other piece of 3½ x 9-inch pipe slightly and flare one end of the 5-inch by 3-feet pipe to the same taper, but so as to let the smaller go in ¾ or 1 inch past the end of the larger. Heat these flared ends to about welding heat, slip the small end of the smaller into the flared end of the larger so as to let 3 inches or 4 inches of the small pipe extend. Raise a good welding heat, slip end X of the piston in through the small pipe so as to use the shoulder of piston Z as a set to drive the small pipe home under the sledge, then withdraw piston until X reaches just through small pipe and draw down under welding heat to 5 inches. Place the end of pipes into the fire and raise to a good running heat and turn down the end of larger pipe over end of small pipe in the fire. If the base of small pipe is

out of shape, straighten it up with a mandrel or with end X of piston so that the shaft of piston will work in and out through it freely, but not too loosely. You have now made the shell and piston and striking head of the jars, which is the important part of such jars. Your next step is to put these parts together.



A SHOP SIGN THAT COMPRISES OVER SEVENTY HORSES.

Shove shaft X, Fig. 2, up through the large pipe and head H, and scarf X for making a cleft weld. Take the pin or male section of joint and draw down and cleave the stub end to receive X. Get up a good heat and clean out your cleft and weld (I advise screwing up the joint and handling the whole joint in order to protect the screw and give a good chance to drive the tongue home in making this weld). Now comes the hardest weld on the job, and one cannot be too well fixed for it.

Screw the box or female of joint onto a bitt or a sinker bar, and draw down and round up the stub to fit snugly in the open end of the jar shell for 3 or 4 inches, allowing the stub to taper to the wrench squares. Flare the open end of shell and slit it for about 3 inches, get both parts lined up in the fire in such a way as to permit them to be turned round to get an even heat without getting out of line. Work them so as to get an even heat for welding before driving together when your heat is right; drive together solid and while in the fire let one man turn the jars round while the other hammers down the lips of the weld. Do not strike too hard and work *down* the weld from the shell of the lips. In this way the weld is solid throughout, and if care has been taken very little turning will be required to make the jars line true.

The tuyere in my fire was a piece of 2-inch gas pipe fastened to 2½-inch hose which I used to carry air from a 16-inch fan on the machine, driven at from 6,000 to 10,000 revolutions per minute. My fire was one foot deep and I burned off three hammer handles making the last weld.

I used one half ton of coal to run the engine and smith fire to do the job. In heating the pieces of pipe, it is best to close the end which is out of the fire to prevent it from burning up in the fire; red clay and salt reduced to a powder is the flux used. The vent holes are ¾-inch holes set four on a side. They are made after the jars are welded together and are there to keep the jars from being deadened when under water. These jars cannot become locked by stones getting between the heads and they turn the drill at every stroke, as regularly as clock work.

If desired, the shell may be welded direct to the drill stem, and a piece of hydraulic pipe, large enough to receive the rope, welded to the shaft at X, Fig. 2. This must be of sufficient length to take about a foot of rope, with four or five ⅝-inch holes drilled through the pipe, at or nearly right angles, to admit rivets to fasten the rope.

An Example of Originality in Shop Signs.

Speaking of originality, just glance at the accompanying engraving which has been reproduced from a photograph of a fine shop sign. This sign is owned by Mr. J. R. Pinck, a prosperous Buffalo smith.

It is a remarkably ingenious piece of work, the two sides being unlike, and containing, in all, about seventy different horse models. The life-like dash and artistic detail worked into the piece are unfortunately lost in reduction of the picture to so small a scale. In the original, the horses are all painted in life-like colors and the positions though fanciful are nevertheless full of life. The entire sign is about four feet by two and a half. It hangs inside the shop just at the entrance, where it is often admired by people passing by.

Mr. Pinck was asked why he does not place the sign outside, above his door. He replied that it would not remain there very long. This very unique piece of work is made of hard wood and about the edge is placed a band of iron.

Mr. Pinck takes justifiable pride in this artistic sign of his, and declares he would not part with it for three hundred dollars.

A Stroll Through An Axle Factory.

It may be interesting to AMERICAN BLACKSMITH readers to see how axles are made in a large shop and to note the important points in their manufacture. The following description of their process of manufacture in the shop of the Dalzell Axle Company at South Egremont, Mass., is here printed and illustrated through the courtesy of that company.

In a large business such as this it is necessary to carry an enormous stock of metal constantly on hand. Hundreds of tons are stored in a suitable yard, conveniently divided for the accommodation of the various sizes of iron and steel, and arranged for their easy handling. From the yard the bars as they are needed, are conveyed to the forging department, Fig. 1, where they are cut up in suitable lengths by means of powerful shears capable of cutting at one clip the largest bar as easily as you would cut a string with a pair of scissors. The metal is fed to the shears on a rack or table and the lengths regulated by a gauge. The pieces drop into trucks, which carry them to the furnaces, where they are heated preparatory to being subjected to the forging process. For convenience and to prevent loss of heat the forging hammers are placed near the furnaces. Petroleum is used as a fuel instead of coal, there being an appreciable amount of sulphur in the

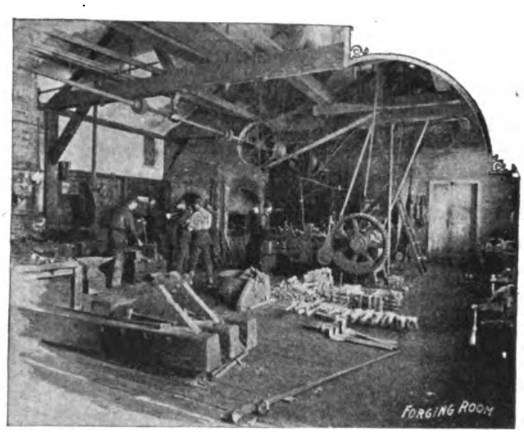


Fig. 1. A WELL EQUIPPED FORGE SHOP FOR TURNING OUT AXLES.

latter which is objectionable and from which petroleum is free. One of its best effects is the facility afforded for the nice regulation of its flow, insuring any degree of heat desired. The petroleum is

stored in large tanks and fed directly to the furnaces.

There are a number of hammers in the forging department—some of them trip-hammers, some small hammers for light work and large ones for heavy work. As shown in Fig. 2, one in particular is worthy of note, being one of the largest power hammers in the country. It is so nicely adjusted that it can deliver a blow of fifteen hundred pounds or one as light as a feather, at the will of the operator. To witness its operation as it varies its strokes with every wish of the manipulator makes it appear as if possessed of intelligence. To deaden the vibration from the powerful blows and secure absolute solidity, the foundations were made of timbers eighteen inches square and eighteen feet long, of which more than six thousand square feet were used. In the forging department also are upsetting machines for making wrought boxes, forges for making flap and crank axles, emery grinders for finishing flaps, and formers for shaping crank axles. In all the forging work, axles are produced of the precise shapes required, all so smooth as to require but little hand work, and what lathe work is necessary is reduced to the minimum. The economies thus effected, however, are in the interests of accurate and beautiful workmanship.

Fig. 2. LARGE POWER HAMMERS USED IN THE MANUFACTURE OF AXLES.

To preserve as much as possible of the original fiber of the material uncut is an important point. The method of forging is that of drawing the metal under the hammer instead of upsetting the collars from small stock. For this reason the material must be of sufficient diameter to form the collar; it is then drawn down by forging under dies until the desired shape of arm and stock is obtained. This process makes a stronger and much more reliable axle than can be obtained by using a smaller size of metal and upsetting the collar, or even of welding it on. Upsetting disturbs the fibre and weakens the axle at its point of greatest strain.

From the forging department the axle is taken to the turning room, where accurate engine lathes and delicately adjusted axle-turning machines accomplish the work desired. On the engine lathes are turned the Collinge axles—that is, those which have no taper. The tapered arms are turned on what are called "rams." These are constructed on the plan of a turret lathe, with a series of box tools having knives conforming to the different shapes which the operator is to produce. These machines are of recent invention, enabling one man to do the work of four men by the old method. The work of this department is intensely interesting, though offering by its quiet and close calculation strong contrast to the exciting scene in the forging department, where all is noise and shock amid furnaces and flying sparks. In the turning room the nicest perfection of detail is watched. Some of the machinery for cutting out cup axle collars, oil grooves in the spindles, milling the edges of collars, nuts, etc., is intricate and very ingenious. Here also are punches, large and small, for various parts of the work.

An axle is not by any means finished when it leaves the turning room. It is purposely left sufficiently large to undergo the process of grinding and fitting. To insure an absolutely perfect bearing, four different processes are necessary. After the turning process the arm is filed with smooth files so as to conform more perfectly to the interior of the box. It is next ground with fine emery and oil until every portion of the arm fits perfectly and has a wearing surface on every part of the interior of the box. This is called "ground fitting" and is done in a separate department, where a finer surface is produced on the spindles than is possible by any other method. Next comes the polishing, which is done with very soft pine clamps, using flour emery and oil, securing a perfectly smooth, even surface. The axle, if it be made of iron, is now ready for the steel covering process.

This is an improvement over the old case-hardening process, carrying the hardening deeper into the metal and toughening it at the same time. It brings an axle finished with the required shape to the tempering department, where it is placed in a retort—an iron box containing about a dozen axles, packed about with ground bone, with a large percentage of carbon admixture—which box, with others, is placed in the furnace, where the heat is evenly distributed to each axle, reaching from the surface of each spindle to its center with the same intensity, so that all axles are heated exactly alike. The boxes are surrounded with charcoal, and are brought to a cherry heat, which is maintained for from three to four hours, according to the size of the axles and the depth of hardening required. When the required degree of heat has been reached, it is not permitted to exceed that point. When ready the axles are taken out and dipped in water or oil, which fixes the temper and hardens the surface.

This process requires an annual consumption of ten thousand bushels of charcoal and is hence very expensive. The tempering has the effect of slightly warping the axles, making it necessary to straighten and refinish them through the ground-fit and polishing processes. When an axle is finished in this manner it possesses all the features of an ideal bearing. It is perfectly round and true; the surface is as hard as glass and just as smooth, and if fitted with wrought iron, a case-hardened box will run for years without showing wear.

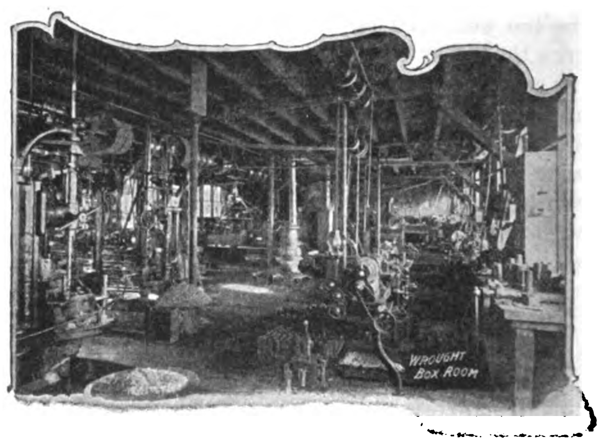


Fig. 3. A DEPARTMENT WHERE AXLE BOXES ARE MADE.

An axle box is almost, if not quite, as difficult to make as the axle; it has

been a subject of fully as much study and experiment, if not more. A variety of metals and mixtures of metals have been used with more or less success, but the wrought case-hardened box now made here has proved the most satisfactory.

It is necessary to have a metal that is tough, not liable to break, and with a wearing surface that is practically indestructible. The first efforts in this direction that presaged success were made in 1870, using boxes made of gaspipe, cutting threads on one end, on which a malleable iron collar was screwed. This was very unsatisfactory. The collar would get loose. Attempts were made to upset the pipe enough to form the collar. This was successfully accomplished, and then the case-hardening process was applied to the finished box. Costly machinery was installed to do this forging.

The iron pipe is cut into suitable lengths by a machine which works automatically, requiring little attention from morning till night. After being heated and upset as described, the interior of the box is shaped in upright drill presses, where it is bored out with fluted reamers, (see Fig. 3). Then the outside of the box is turned on an engine lathe, when it is ready for the tempering process, which is almost identical with that used on axles. After this it is turned and "ground fit" with oil and emery and then polished until the interior is as fine as a gun barrel. Fig. 4 shows a photographic view of one of the Dalzell machines for upsetting wrought boxes. It is very intricate in construction, weighing more than fifteen tons, and the upsetting plunger exerts a pressure of one hundred and forty-seven tons. There are but two machines in the world of similar construction.

Timely Talks on Carriage Repair Work.—3.

A. J. YEAGER.

As we pass along in the line of carriage repairing we run into the repairing of wheels, coming in contact with all kinds of ailments; loose tires, loose hubs, wheels out of dish and wheels so nearly worn out that it is impossible to to repair them at all. But the customer says, "I want this fixed so that it will do for awhile. I intend to buy a new one in the spring."

Take the first ailment of loose tires, and most smiths know how to repair them. I shall, however, tell how I do this work to best advantage. I use a cold tire setter. My kind is a "Shaw" cold tire setter, made in Kalamazoo Mich., and it will set tires up to 1¼ inch, and do it well. Some smiths will say "what are you going to do with loose spokes that rattle and should be wedged?" But how many spokes do you find that rattle sideways of the rim? It is a very small proportion of them, and when they are worn so that

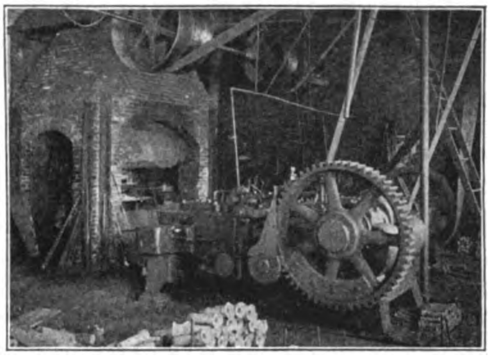


Fig. 4. A MACHINE FOR UPSETTING WROUGHT AXLE BOXES.

they rattle very badly sideways they should be taken out and new ones put in, for wedging them up will split them so that they are no good, oftentimes splitting three or four inches. Now with a cold setter you take off one felloe plate, cut out a small piece with a hack saw and proceed to shrink your tire. If you have not sawed out enough the first time, cut out some more, and proceed with shrinking until the tire is tight and the proper dish in the wheel. You will find your spokes all tight and your tire will stay tight longer than had you taken it off the wheel and set it the old way.

This same process is followed in case of a wheel that is dished the wrong way. We have a tool called a disher that draws the wheel back into shape, and we cut out the felloe and shrink until we have the proper dish in the wheel, and the right way, too.

Now in case of a wheel that has become slightly loose in the hub on account of being felloe-bound, we again use our cold setter, sawing out and shrinking the tire and driving down on the spokes until we have the spokes tight and the proper dish in the wheel. The Burt Manufacturing Company, Kalamazoo, Mich., make the tire-setter we use.

Now to come to rubber tires, the repair of which has become quite a business in itself. I am of opinion that few smiths have equipped themselves with the proper tools to do this work in a manner to satisfy their customers or themselves.

These tools do not cost so very much and are the best investment, for the money, that a smith can have. Rubber tires have come to stay, and it is only a matter of a little while until nearly every repair man will be called upon to mend them.

The tools can be bought from any tire maker or most of the jobbing houses in heavy hardware throughout the country, and they are being advertised quite extensively through the trade journals. There are quite a variety of them, and some are better than others. I have found those made by the Hartford Rubber Works Co., Hartford, Conn., and Morgan & Wright, Chicago, Ill., to be the most practical.

The repair of rubber tires is a new departure in the blacksmith's line and the most up-to-date fellows are the ones that will reap the benefit derived from the business. I am judging from personal experience, from the number of wheels sent me from out of town to be repaired—from towns of from 500 to 3,000 and over in population. Here is a field for the up-to-date smith that will increase his income vastly in the near future. In future articles I shall explain how to make swedges for welding channels and how to prepare an old tire for remounting.

A Few Interesting Prices From Illinois.

EVERSOLE BROTHERS.

The prices for shoeing, plow work, setting wagon tires, etc., are practically the same all over the State of Illinois, there being slight variations in different parts.

Our shop is very well equipped and we are always prepared to dispose of work quickly during the rush periods.

We have an excellent gasoline engine which answers all practical purposes. Among other useful articles, we have a number of emery wheels, a saw, drills and an engine lathe.

One essential feature to success nowadays is to have up-to-date tools in your shop and where it is possible to increase trade by using power, install an engine. It will pay for itself in a short time.

The following shows about how our prices run:

Four new shoes	$1.50
Four old shoes	.80
Four hand turned shoes	2.00
Sharpening plows, up to 14 in.	.25
Sharpening plows, 16 in. and up	.30
Pointing plows	.75
Setting buggy tires, per set	2.00
Setting wagon tires, per set	2.00
Grinding discs up to 16 in., per wheel	.15
Grinding discs, 18 in.	.18
Grinding roller cutters, each	.30

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Sharpening Rasps.—Will some brother smith tell me how to sharpen horse shoe rasps so that they will stand as good as new? J. H. BARTHOLOMEW.

Lien Law vs. Cash.—With regard to the Lien Law, in the November number, I saw that one brother advocates a cash basis. I would prefer a Lien Law, from the fact that I find at times my best customers do not have the ready cash. A Lien Law would not hurt them, and it would bring the bad ones to time, and I hope it will soon be perfected in Illinois. E. B. DAVISSON.

Shoeing Racks.—In reply to B. Q. Davis in regard to shoeing racks, would say that I believe the Barcus horse stocks to be the best and the easiest operated. I have shod a mule as small as five hundred pounds, and a horse as large as fifteen hundred pounds, and they work as well on one as on the other.

I saw several different advertisements in THE AMERICAN BLACKSMITH, and I selected the Barcus, and do not want any better. If Mr. Davis will write to the Company, they will answer all questions. I think every man that shoes horses ought to have a pair of Barcus Stocks.

B. B. MALLORY, Racine, Ohio.

How Make a Punch.—I would like to ask some of the brother smiths how to make a machine for punching iron, holes from 1/4 to 1/2-inch. T. ROWAN.

Quarter Crack.—In answer to J. S. H., in the November issue as to how to shoe a horse that has quarter crack, the back part of hoof being loose, would say weld a calk in front of the quarter crack and cut the heel calk off. Bend the end of shoe down one-quarter of an inch and flatten it so it will bend easy when the heel grows down. I am shoeing three horses like that every four to six weeks and none of them are lame.

FRED RICKERT.

Questions on Axles and Chilled Castings.—I would like to ask some of the brother craftsmen through THE AMERICAN BLACKSMITH, of a quick and correct method to get the pitch and gather in a wagon axle, say from 1 to 1 1/4 inches.

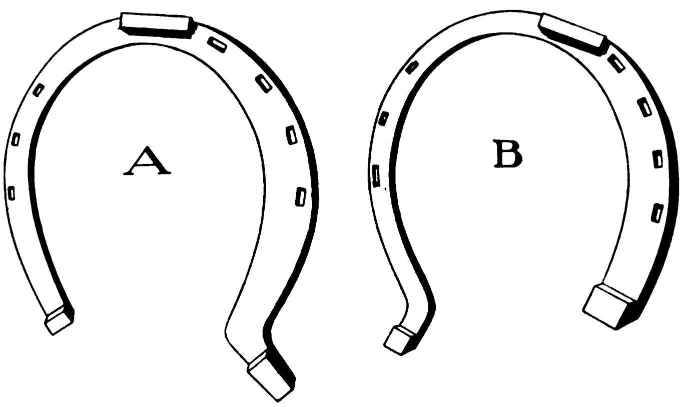
I would also like to know of a way to drill chilled castings. I have tried burning sulphur, but it does not prove satisfactory.

Might add that I am much in favor of a bracksmith's Lien Law, though I have no fault to find with collections myself. Prices, however, are altogether too low. I like THE AMERICAN BLACKSMITH very much, getting a great deal of useful information from it. Will contribute something for its pages later. C. W COOK.

How I Bound My American Blacksmiths.—I first took a piece of linen the size of one of the papers, that is, when it was spread open. Then I got my papers all in rotation. Next I found the centre of the linen and sewed every paper to it seperate, sewing through the centre of the paper with string. When I had sewed them all on I got a piece of black cardboard, large enough to make the two covers, and by taking a piece of linen the width of the thickness of the twelve papers, I fastened them together with paste. Now by taking the linen cover and pasting it to the inside of the outer cover, it is held securely in position. I received one of the beautiful pictures which were sent with the April issue—The Village Smithy. By pasting it on the outside of the front cover it finished the job as if a book-binder had done it. GEO. E. B.

Two Shoes.—In answer to D. W. Cryce's question in the October number, I will give the following shoes, which I think will answer his purposes.

Shoe A, is heavy outside, with trailer calk, and light inside fitted very closely all around to the heel. The calks are of equal height, but the outside calk should have at least four times as much ground surface as the inside one, and the toe calk should extend from a little distance inside the center to outside. Lower the inside of foot as much as possible, or until the foot is level.



TWO GOOD SHOES FOR PREVENTING INTERFERING.

Shoe B, is heavy outside, with calk well under the heel. Light inside, fitted closely to heel and the heel turned out enough to make the horse stand level. The heel calks should be 3/8 of an inch high, with a calk 5/16 of an inch high, welded on at toe nail on the outside. This makes the horse break over the centre of the foot and usually stops hitting. The foot should be dressed level if possible. F. W. B.

Power in the Shop.—I have been a subscriber to your paper, or better, to our paper, for sometime, and would not do without it for many times the price. I learn something from every issue.

My partner and I have a shop 25 by 110 feet. About a year ago we put in a 2 1/2 H. P. Weber engine, and have never regretted it one minute. Our trade has improved wonderfully, but we are doing it with the same force. Our engine pulls a blower for three fires, a drill press, band saw, rip saw, grindstone and disc sharpener.

Brother smiths, why don't you handle farming implements? We have sold five grain binders, two mowers, two rakes and four disc plows, and will do $3,500 worth of work in the shop this year. We shall soon want a power hammer. Perhaps some brother can tell us the best kind to get for general repair work.

I am greatly in favor of all smiths organizing. Material is high and something must be done. W. C. POWELL.

Questions on Welding Pump Rods.—I would like to have several brother smiths answer this:

My business at the present is welding pump rods for oil wells. As I have about 8,000 welds to make right soon, I would like to learn of some process which will enable me to weld them rapidly and make first class welds. Could it be done in a forging machine? If so, what kind of a machine?

Is there any small power hammer or pneumatic hammer or welding machine of any type that could be used successfully?

Has any brother any idea of how a home-made hammer or machine could be made. It might be that I would purchase or make a small tool for upsetting and scarfing the rod the same time, and use some other tool for welding. I am at the present time welding rods that will be shipped to India.

The different size joints that I weld are: 5/8-inch, 7/8-inch and 1-inch. They are box and pin joints. The square on the joints corresponds with the size of the joint. The rods I weld are both iron and steel, the sizes are 5/8-inch, 9/16-inch and 3/4-inch, and are from 25 to 34 feet long. When finished, the joint (box and pin) are about 9 inches long.

I weld the 7/8-inch square on 9/16 and 5/8-inch rods, and the 1-inch square on 3/4-inch rods,,and 5/8-inch square on 9/16-inch rods. I upset the rods considerably when I scarf them. I would like to have a half dozen at least give their idea on the above as soon as possible. FRED BARNEY.

Horseshoeing—Ice Tongs—I think THE AMERICAN BLACKSMITH is a great source of valuable information to all concerned. I have been taking the journal for about six months, and can certainly say it's my friend and helper. The numerous topics discussed therein are well worth the while of any smith harboring and remembering. Also, the reader has a great advantage of being able to simply ask for anything he desires to know, and he receives the desired information. This, alone, is worth the subscription price.

As to myself, I have a great interest in horseshoeing, and frankly say that any man who undertakes to shoe a horse ought to know more than simply to pare the foot even and nail the shoe on. I believe that the horse often realizes pain from improper shoeing, though it is not noticed by his master. The latter, if slightly scratched by a nail in his shoe, hurries to the shoe maker's shop, pulls off his shoe and declares he can stand it no longer. Here is the difference between man and beast. The journal cannot take up too much space on this subject for me.

I make a very convenient kind of ice-tongs. The main feature of these is that they cross each other in front when closed. By this means a piece of ice, any size, can be securely held when lifting by one handle. Many ice tongs are made so that only one size piece of ice can he held. Care must be exercised that the sharpened ends are bent up just right for any cake of ice. They may be used either with a rope or by hand.

MONROE S. MUMMA.

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Cable address, "BLACKSMITH," Buffalo. Lieber's Code used.

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State Lien Laws.

Blacksmiths and wagon builders, or repairmen who are interested in securing State Lien Laws to protect themselves from bad debts and losses of this kind, should write to the American Association of Blacksmiths and Horseshoers, Buffalo, N. Y., for particulars of their plans for obtaining Lien Laws. Every craftsman can aid a little, and should write at once. No expense is attached.

A New Prize Article Contest.

The Gas Engine.

A great many readers of this journal are turning over in their minds the question of whether to put power in their shops or not. The experience of other smiths who have bought engines should be of great help to them in arriving at a decision, and hence the following prize offer is made in order to stimulate the writing of articles by craftsmen who are in position to say whether power in the shop is a desirable thing for blacksmiths and wagon builders.

"Does it pay the blacksmith to put in a gas engine, and why?" For the best article on this subject we will give a first prize of ten dollars, a second prize of five dollars, and three third prizes of yearly subscriptions to THE AMERICAN BLACKSMITH. The conditions are few. The articles must not be more than about 800 words in length, and the writers must be AMERICAN BLACKSMITH subscribers who have had practical experience with a gas engine in a blacksmith, wagon or repair shop. The contest closes April 1st, but the sooner the articles are sent in, the better. Those who write should bear in mind the subject—why does it pay the blacksmith to put in gas engine power?

The gas engine has been selected as the power for discussion, because every indication points to its being more suitable for small units in small shops than any other form, and because twenty smiths buy gas engines to one who buys any other kind of engine.

In writing upon this prize topic, the smith can discuss his experience as to the cost of fuel and repairs, the machines that he drives with a certain horsepower, the gain or saving in time, labor or money due to the engine, and the general advantages of the gas engine.

Punctuality and Punctuality.

Punctuality is commonly confounded with the ability to get up and go to work "with the lark." But this is only a semblance of the real punctuality.

The punctual business man is one who is strictly uptodate in all his doings. His catalogues and calendars are out even a little before the date required, showing that he is not only progressive, but aggressive, too, in point of time.

The blacksmith who makes a point of opening his shop on time day in and day out, and of being always at his post from gaslight to gaslight may call himself punctual. But suppose his work is never done when promised, who cares how many hours he spends at the forge? The business world counts only the practical result of labor —the finished product—not the number of hours devoted to it.

"Seizing time by the forelock," doing at this minute what could not have been done a minute earlier, always endeavoring to encroach upon the future —this is punctuality.

Higher Prices for Blacksmithing Work.

All those who are thinking over ways and means for increasing the amount of money which the shop-owning blacksmith receives for his labor, will be interested in the article on page 91 of this issue. If the smith is not paid as well as other mechanics in proportion to his skill and labor, how shall the trouble be remedied? A solution is proposed in the article mentioned.

The Manufacturer's Catalogue.

It would be interesting to know just how many smiths make a practice of writing for catalogues. Manufacturers and dealers are glad to send their catalogues to anyone free upon request; in fact their catalogues are issued for the purpose of placing them in the hands of interested parties. The habit of writing for the printed matter of firms who manufacture machines, tools or supplies is an excellent one, for it greatly aids the progressive craftsman in keeping abreast of the times. A covered shelf or box should be arranged in the shop in which to keep all such catalogues neatly and ready for reference. It is a good plan, therefore, whenever a new tool or labor saving machine is seen advertised, to sit down and write for a catalogue, mentioning where the advertisement was seen. It is surprising how much solid information and real benefit can be gained with so little effort in this way.

The Shoeing Treatise by Adams.

In the January paper it was announced that a special series of articles on horseshoeing by John W. Adams, A. B., V. M. D., would be started in that issue. At the last moment it was found impossible to accommodate the first chapter, owing to lack of space, so that it had to be postponed till the present issue. The delay is regretted, but the series will now proceed to completion

without interruption. The eminent standing of Professor Adams is more than sufficient to recommend his articles to the careful perusal of all who are in any way interested in shoeing. The order of treatment will be as follows: The anatomy, growth and care of the hoof; types of feet; examination for shoeing; preparation of the hoof; the shoe; hot fitting; the bar shoe; the rubber pad.

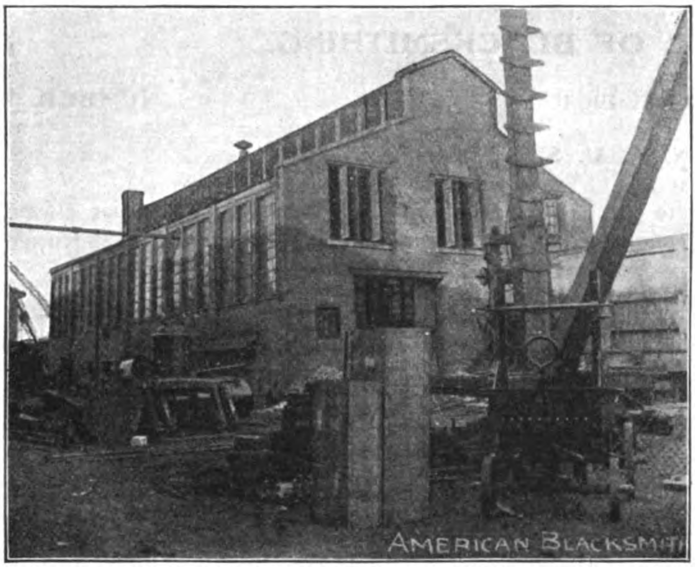


Fig. 1. BLACKSMITH SHOP AT THE IROQUOIS IRON WORKS.

The Iroquois Iron Works Forge Shop in Buffalo.

W. G. GAMBLE.

This shop was designed and built in 1896, by W. G. King, the present manager. As shown in Fig. 1, it is 80 by 40 feet, with 18-foot sides half brick and half window-sash ventilator. Through the entire length the side sashes are pivoted on a vertical axis, and connected in sections of three sashes, which open with one ½-inch rod the entire length of both sides. The end windows are in pairs and open likewise. The top ventilators are in four sections and can be opened or closed from the floor by pulling a ½-inch rod. The shop can be cleared of the most dense smoke in 10 minutes by opening all the ventilators. There is a 60-inch induced draught blower, or exhaust, which is piped to hoods over fires to draw the smoke and dust therefrom.

The shop has six smith forges and fire furnaces. One is a coke furnace which will heat angles up to 6 by 6 inches, and 14 feet long. Another furnace heats channels 12 inches wide by 14 feet long. Another takes the place of a hollow fire and can be lighted and ready for a heat on heads, etc., of forgings, in 15 minutes. This furnace well pays for building when there is much machine forging done which would otherwise require a hollow fire, the expense of which from day to day is considerable. Still another furnace is the tire setting furnace, which is built in the wall and therefore takes no space in the shop. This will set about eight heavy tires per hour. The mill-heating furnace has a 3-foot heating chamber for roughing out machine forgings to be finished up by the smiths. It has been used to make double-throw crank-shafts up to 960 pounds, from scrap iron, and for forging square shafts up to 1700 pounds in weight.

There are three boom cranes, all steel, with roller and ball bearings. One man can handle one ton with ease on any of these cranes. One is 16-foot boom, another 14-foot and another 22-foot. They are fitted with triplex and duplex tackles with which one man can raise or lower one ton.

In the center and towards the end of the shop, is a Morgan steam hammer, under which steel billets 5 by 14 inches have been successfully worked into cranks and kingpins for steam rollers.

This shop makes forgings of all descriptions and for all purposes, giving estimates on any kind of forge work. It is well-equipped for angle or channel work, as is aptly indicated by the engraving of the steam roller frame, (Fig. 4). They bend these frames from channels, 6 inches up to 12 inches. The frames weigh from 500 pounds to 2,000 pounds.

In the center of the shop is a face plate, 7 by 10 feet, which stands 15 inches from the floor, has 1¼ inch square holes, every 3 inches of its face and is 3 inches thick. It has a full set of moon bars and dogs and pins. An angle, channel or I-beam can be easily handled at will. There is in this shop a Long and Alstatter press which can shear bar iron up to 2½ inches square and can punch holes up to 6 inches diameter and 1¾ inches thick, hot. They have a full set of dies, including coping dies for channels and I-beams. The coping die is used for cutting off channels and I-beams. It is also equipped with scalloped shear-blades for rounds. The work is all laid out and the stock all sheared up before the job is started, which reduces the cost of production considerably.

Fig. 2. ONE OF THE FURNACES AT THE IROQUOIS SHOP.

Talks to the Jobbing Shop Painter.—11.

Fashions to Govern the Painting and Striping of Carriages the Coming Season.

M. C. HILLICK.

Today the carriage painter, regardless of his location, must be very largely governed by the degrees of fashion in respect to the colors and striping employed in painting vehicles. Formerly what was known as "prevailing style" was confined principally to the large towns and cities. But the invasion into rural communities of the telephone, the free mail delivery system, the daily paper, and a hundred other forms of modern conveniences, has brought the question of style, in its relation to carriage painting, prominently to the fore-front. Isolated country districts are a thing of the past. The farmer boy is no longer

satisfied with most any color so long as it is nearly all red. He wants the best buggy painted according to the prevailing fashion of the cities. It is, therefore, strictly a matter of business, and not

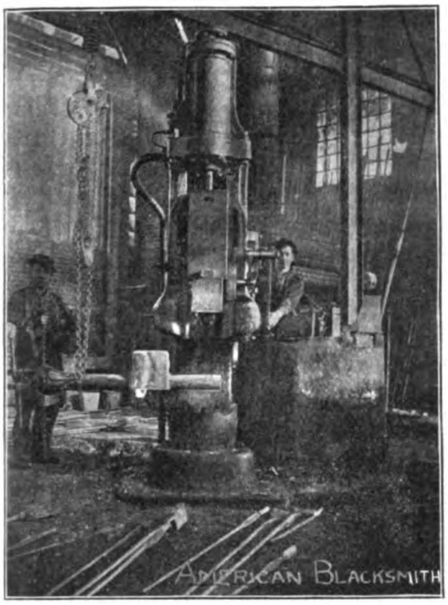


Fig. 3. HAMMER FOR MAKING CRANKS AND KING PINS ON STEAM ROLLERS.

one of sentiment that should move all carriage painters of both city and country to study the latest fashions of painting the vehicle equipment.

Generally speaking a majority of the colors popular during 1903, will retain their popularity during the year 1904. For the extremely light build of buggies and speeding wagons, black bodies and running parts varying from brightest red to gayest yellow, will be very much in evidence. Carmine glazed over an English vermilion ground offers a glorious red for speeding wagon running parts. Light olive, Brewster and Quaker green running parts with seat panels, or spindles, in case of spindle seat, painted with same color, will be popular with a critical class of users who prefer a quiet elegance of effects to the flash of color which the reds and yellows afford. The striping on this class of vehicles, on all classes, as a matter of fact, will be done in lines drawn closer together. In other words, the double-line stripe drawn at a space of 3/8-inch between lines will be contracted to a 1/4-inch space between lines, and the lines will be drawn very fine.

The medium weight buggy, or the buggy better known as "the all-round buggy" of both town and country, will continue, for the most part, to be painted black body and running parts graduated from 75 or more shades of red, to blue, green and black. Dark rich reds for this useful class of vehicles will have the preference, when reds are chosen; such reds, for example, as are obtained by glazing No. 40 carmine over an Indian red ground. There is a class of medium weight buggies handled by liverymen, and popular with drivers who rent vehicles, which are painted usually with some of the high-colored reds such as, for example, Brewster red, 20th century red, coach painter's red, flamingo red, etc. These reds are striped with double fine lines of black, or with a 1/8-inch line of black paralled with a fine line of black on either side, and when the work is nicely executed they afford charming examples of the carriage painter's art.

The medium weight buggy will be seen largely in evidence the coming season with running parts painted Brewster, olive, Quaker and the fine, old-fashioned bottle green, all in medium and dark shades, and striped in lines of black or gold, or carmine, the gold and carmine predominating. And when we speak of gold we mean, of course, gold bronze, which, procured in a powdered form, is mixed with finishing varnish and pale drying japan, and used as a striping color. On the olive and Quaker green surfaces the gold bronze stripe gives a particularly elegant effect. Running parts of dark ultra-marine blue will please some very exclusive drivers, and this blue should be striped with either black or exceedingly fine lines of gold, as fine as they may be drawn. Black bodies will have the preference, although upon a certain style of body the seat panels will be seen painted with the same green or blue used upon the running parts. Surreys and phaetons and cabriolets, black or glazed red, double lines. Seat panels will also be painted in deep shade of ultra-marine blue, with running parts medium shade of same color, striped in 1/16 and 1/8-inch lines of black, the width of lines depending upon the weight and proportion of the vehicle.

In the middle and eastern sections of country, seat panels on above class of vehicles will continue to be painted deep shade of maroon, with a bit lighter shade for running parts, in which case the striping should be done in black.

Seats and panels will also be painted in rose, chatamuc and purple lake; moldings, black; running parts the same color as the panels, and striped in two and three lines of black. Landaus, broughams, rockaways, etc., are painted either black, or panels deep, rich green, or maroon; moldings black, with running parts in colors to harmonize and illuminate the body colors. For this class of carriages the deep carmine or black lines will be accepted as the most fashionable.

The increasingly popular runabout wagon, useful alike on country roads and city boulevards, will be painted in various combinations, dark colors prevailing. The black body and seat panels deep Indian red, with running parts a shade lighter; and striped with two fine lines of a still lighter shade of red, or with fine lines of black, will prove an exceedingly attractive style of painting these luxurious and useful vehicles.

Black bodies and light carmine running parts will also command a fine run of popularity. So, too, the black body, seat panels, dark, rich Brewster, olive or 20th century green, and running parts light shade of these greens, will have its

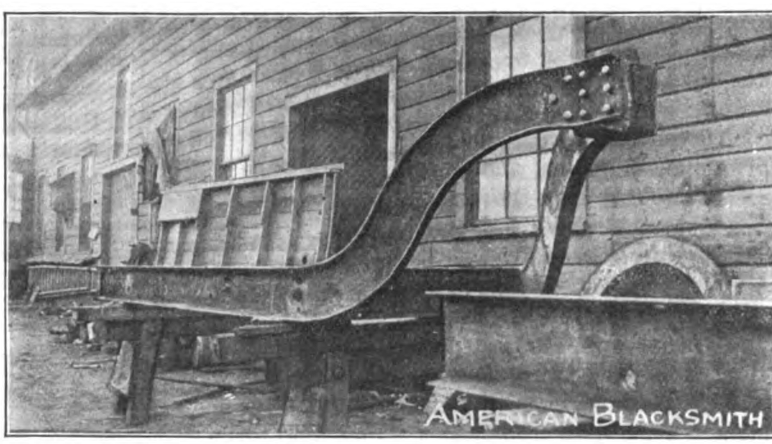


Fig. 4. STEAM ROLLER FRAME. EXAMPLE OF WORK TURNED OUT BY THE IROQUOIS SHOP.

vehicles popular at the present time with rural drivers, will be painted, seat panels dark rich green, body and moldings black, running parts a shade or two lighter green, the striping being done in admirers as a style at once exclusive and elegant.

In the matter of painting business wagons, the tendency is strongly in favor of dark, rich shades of the reds,

blues and greens. In fact, indications at this writing point toward a perceptible toning down of all colors used upon business vehicles, and the most prominent Eastern manufacturers, it is said, will vigilantly avoid high colored or extreme contrasts.

The ornate and sensationally striped and ornamented wagon is, so far as the coming season would indicate, a style practically obsolete. Especially is this true of the higher grade vehicle which is being painted in dark rich colors with almost severely plain striping effects. Color effects on the cheaper grade wagon will be greatly modified with fancy striping reduced to the minimum.

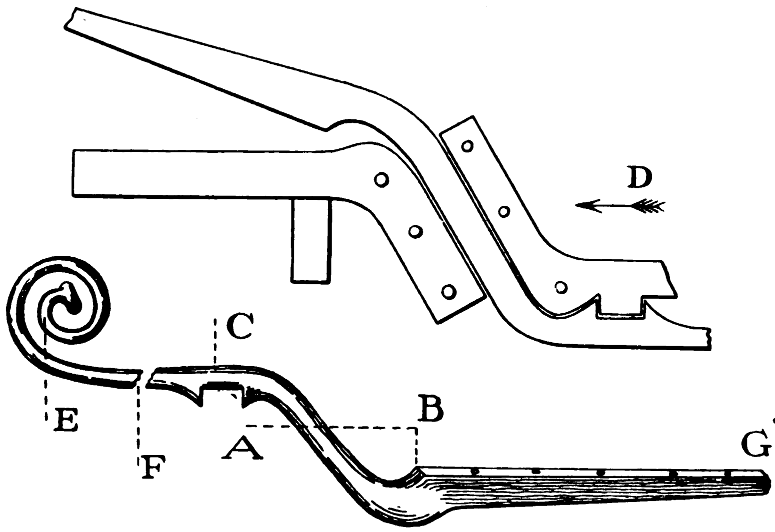


Fig. 2. BODY LOOP FOR A THREE-SPRING, STRAIGHT SILL SURREY.

Wagon Building in the Factory.

Prize Article.—*Continued.*

NEILS PETERSON

The wheels having been unloaded and stacked in the wheel room, are first looked over by an experienced wheel man. If rim bound, they are sawed out at the joints, and the spoke ends projecting over the rim chipped off on a machine built for that purpose. Then a coat of priming is put on, and when dry they are brought into the blacksmith shop and stacked near the forge, where they are to be tired. The smith having this work in charge proceeds by having the tires rolled to the proper shape, and piled near the forge. The wheel is first measured with the traveler, then the tire in the same manner. The tire is marked about 1-16 inch smaller than the measurement of the rim and cut off. The helper takes the end of the tire nearest to him, and by pulling it down and away from the anvil, the tire is sprung in such shape that the top end of the lap will press firmly against the bottom end to prevent it from slipping when in position for taking the heat. The fire being kept in shape to enable the smith to take as short a heat as possible, the tire is placed in the fire and heated to almost a white heat, then removed and some Climax welding compound placed between the lap, (which is made very short) and some on top, the tire replaced in the fire and brought to a welding heat. When taken out and brought to the anvil for welding, the bottom end of the lap is placed directly over the edge of the anvil nearest the smith, and with a few heavy blows with the hammer the tire is scarfed and welded in the same operation. Now the smith turns the tire down to the left, while edging up, again raises it and smoothes the flat surface, then stepping to the right and facing the anvil lengthways, he lets the tire down encircling him and resting on a trestle placed there for that purpose. The edges are thus swaged to shape. The smith, while in position, measures the tire, the amount of draft being judged from the condition of the wheel. (The methods here described for welding tires apply to light work only; heavy tires must be scarfed before welding.) The tire is now set aside and allowed to cool. The helper then takes and heats it in another fire, pulls it over the wheel, and cools it in water. The wheel is then placed in a machine for truing up the tire. This machine consists of a pair of grooved rollers with a screw adjustment for raising and lowering the top roller according to the width of the tire. As soon as the wheel is trued up, the rollers are released, the wheel taken out and stacked near the tire drill. This drill is built especially for drilling tires, and is supplied with three bits, one for drilling the tire, one for counter-sinking, and one for boring the wood. As soon as drilled they are passed on to the tire-bolting machine, where one boy drives in the bolts, puts on the washers and starts the nuts, and another boy tightens up the nuts and clips off the bolt ends. when the wheel is ready for the hub-boring machine. This is run at 1,800 revolutions a minute. With it an experienced man can bore and box several hundred wheels per day. When driving in the box, an axle stub fitting the box is put into it, some white lead applied and with a few blows from the sledge the box is driven home tight. The wheels are then loaded on the elevator and hoisted to the second floor where they are painted, finished, and put into racks located in the assembling room and close at hand for the men setting up the work.

The putting together of gears for vehicles in a factory of this size or larger, where several thousand jobs are turned out each year, constitutes no small portion of the amount of work that must be accomplished to complete the construction of vehicles on a large scale. I shall not attempt here to describe in detail the methods employed in putting up all the different styles of gears built at this shop, as it would require too much space, but will confine my remarks in this direction to one particular kind of gear, of which we build a large number, a three-spring surrey gear,

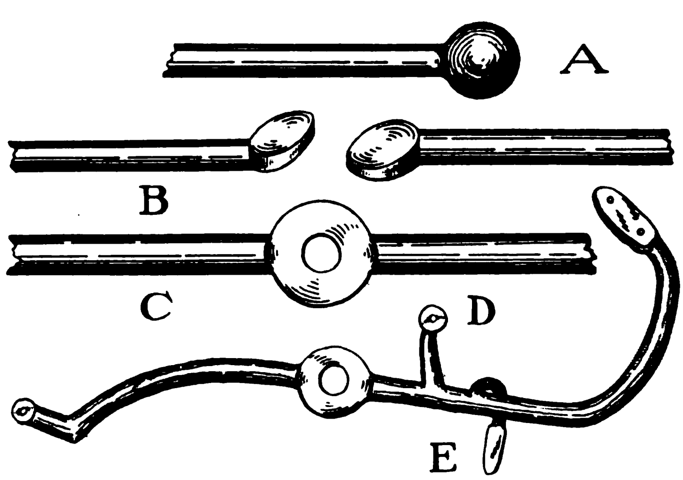


Fig. 3. ARM RAIL FOR AN EXTENSION TOP SURREY.

single straight reach, total length over all, six feet three inches, 1$\frac{1}{8}$-inch axles, 1$\frac{1}{2}$-inch springs, five leaves in front and four leaves for rear springs, single sweep 37 inches long, with 7$\frac{1}{2}$-inch opening, three-quarter 14-inch fifth wheel, and wheels 40 and 44 inches high with 1 by $\frac{5}{16}$-inch steel tires or channels for rubber tires, the same width when ordered. The wood-stock having been made and fitted up for say 100 jobs, the irons for each set are forged as follows: One pair of side stays is made, the front part made from $\frac{7}{8}$ by $\frac{1}{4}$-inch bevel edge stock. The front end is bent to a square angle for receiving a bolt through the headblock and extending back 36 inches on the reach, where the stay brace made from $\frac{5}{8}$-inch oval is welded on and runs back to the rear axle, with a branch brace made from the same size stock welded in and bent to a half circle connecting with the reach. One reach and headblock plate, running full length under the reach, is made, with one heel strap to fit over the square center of the axle, also one circle-guard, one kingbolt brace, one front spring brace; and a front springbar, and one rear springbar spanning the two rear springs are forged and fitted over forms, made especially for these particular set of irons. The irons, when forged, are ground where needed, on the emery-wheel, and finished off on the emery-belt, then marked to a pattern for drilling the holes, each set alike, so that any one set of irons would fit any one set of wood made for this gear, and also drilled to pattern.

The workman putting up gears now bolts the side stays, reach and head-blockplate, the top part of the fifth-wheel, and the front spring, to which the front spring-bar has previously been clipped on to the reachs, while another man is clipping up the axles. This work is all done on the vice bench. In clipping up the axles, one end is fastened in the vice, a piece of band iron or an axle clip having been wrapped around the spindle and bent over the jaws of the vice, to prevent the axle from slipping down when released for turning around, the other end resting in a forked iron driven either in the floor or bolted to the bench. For spacing the clips, a guage is used. Measuring from the collar of the axle, the workman marks the places for draw shackles, clips, fifth-wheel, and kingbolt, puts them on and tightens them up with a socket wrench.

The various pieces having thus been prepared ready to be put together, they are coupled up and the rear axle squared from the king bolt, on a set of iron trestles. The gears are then elevated to the paint shop, painted, finished and stacked in a room adjoining the assembling room.

All regular work turned out at this factory is built in parts and assembled in a different department, except special work built to order and getting out different designs as patterns for regular work. In this case a draft is made full size, on the blackboard, giving side and end views, drop or arch of the axle as the case may be, shape of reach, whether straight or bent. The wood-stock is then gotten out, the gear ironed off and set upon a level floor near the forge. The body is then suspended over the gear in the exact position it is to have when in use. A two-seated job, a surrey for instance, is hung with the rear end about one-half inch higher than the front, for the reason that when under load the greatest weight falls on the rear spring. The measure for loops is then taken, the loops forged, shaped and fitted to their place, places marked for steps, rub irons, etc., and the irons drilled and put on temporarily. The seats are ironed in like manner, and when the job is complete the irons are taken off and a draft made of each, giving dimensions in a stockbook for reference. Forms are then made to fit each iron, these forms and drafts being numbered corresponding to a catalogue number of the job. The forms are then tied together and hung up when not in use.

In Fig. 2 is shown part of a body loop for a three-spring, straight-sill surrey, which is made from 1$\frac{1}{8}$-inch square stock, cut 13 inches long and forged out. The oval part from A to B, six inches in length when finished is first drawn out, then the head, C, is forged with two lips fitting over an iron spring bar at the rear. Next the end fitting under the body is drawn to taper, bevelled, heated and shaped over a form, Fig. 2, D, made to fit in the square hole of the anvil. The scroll or pump handle E, is made from $\frac{7}{8}$-inch oval iron and welded onto the loop at F while straight, and then bent over a form. To complete the job a piece of 1$\frac{1}{8}$ by $\frac{5}{16}$-inch iron is welded on at G, extending full under the sill of the body and connected with the front spring bar.

In Fig. 3 is shown the arm rail for an extension top surrey, made from $\frac{7}{16}$-inch round iron, cut to length. The eye is first made by upsetting the ends of the two pieces, forming a ball, Fig. 3 A, then scarfed, as at B, and welded in a die forming the eye C. The post is then welded on at D, and then the lamp finger, E. The ends of the rails are drawn out and finished, then heated and bent over a form, and fitted to the seat.

In Fig. 4 is shown a small machine that I got up for making collars on goose necks, canopy top standards, fender irons, etc. It is made to be fastened

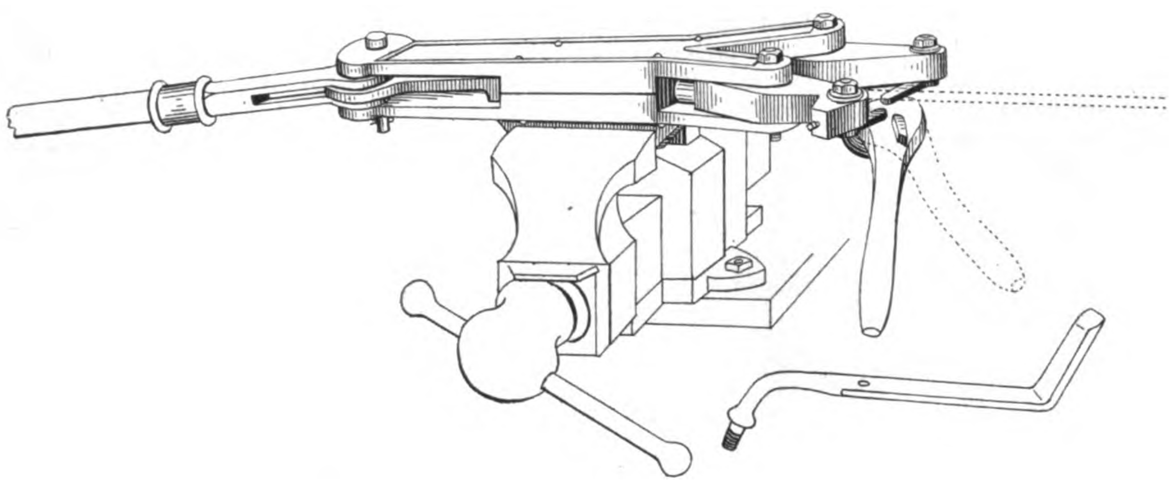


Fig. 4. MACHINE FOR MAKING COLLARS ON CANOPY TOP STANDARDS.

in the vice by the forge. When in use the heated iron is passed in between a pair of jaws, as indicated by dotted lines into a hole in the plunger, not shown in the figure. The handle to the right is given a turn, closing the jaws and gripping the iron firmly, and then by pulling on the handle to the left the eccentric causes the plunger to move forward, coming in contact with the jaws, thus upsetting the iron and forming a collar. The jaws and plunger are easily removed and others put in for different sizes of iron. This machine is also used for upsetting the iron to form the ball when making arm-rails.

(To be continued.)

How to Build a Farm Wagon of very Light Draft.

Prize Article.

F. W. PRICE.

I have a plan by which I can construct a wagon of exceedingly light draft, besides containing all the other essentials of a first-class farm wagon, i. e., strength, endurance, appearance and—longevity. I will guarantee a $3\frac{1}{4}$-inch wagon, built according to the following rules, to run equally as light as the average $2\frac{3}{4}$-inch wagon.

The first thing to do when commencing a wagon is to see that all stock to be used is strictly second growth timber and thoroughly bone dry, after which, select a hub as large in diameter as will contain the required box, say, for a 3x9-inch box use a hub about 9x11 inches and cup the plate one inch and house the heel one inch, thus obtaining a good strong covering for the collars of the skein to protect it from dirt and sand.

The first real construction begins with the wheels, which I build as follows: First take a hub and see that it is mortised for the proper dish, say $\frac{1}{4}$ inch for a front wheel. This may be done by placing a hub on its butt and clamping a straight edge on the point so that it will stand horizontally, directly over a mortise. Then place another straight edge in the mortise, holding it firmly against the front wall. This gives the line that the face of the spoke will follow when driven.

Now run out about $17\frac{1}{2}$ inches on the lower straight edge, and mark. The distance between the straight edges at the hub should exceed the distance at the mark by about $\frac{1}{4}$ of an inch.

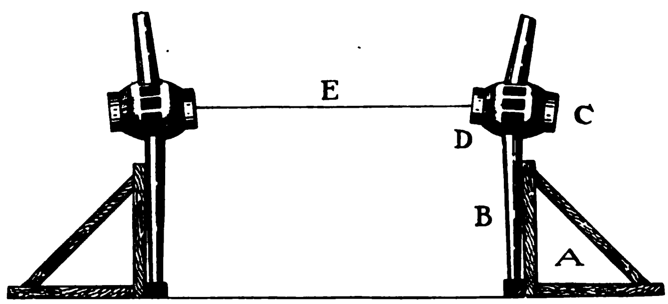
When satisfied that the mortise is right, place the hub on the stool and make a pattern exactly coinciding with the inside of the mortise, and by this pattern fit the entire set of spokes, leaving a scant sixteenth of an inch full all around to insure tight driving.

Now paint all the tenons with a good coat of white lead, and drive by first starting all the spokes, and then going around several times giving each spoke about two smart blows until all are driven up tight against the shoulder.

The spokes being driven, get the radius of your wheel and deduct half the diameter of the hub and measure this distance out from the hub on each spoke and saw off. After this, proceed to bore the tenons as long as the depth of the rim less about $\frac{1}{16}$ of an inch to allow for the rim to settle down against the shoulder firmly when the tire is set.

Now make two felloe patterns (one front and one hind) the exact circle your wheels are to be and of the depth of the rim. Dress the felloes to these patterns exactly. Bore and drive on.

After the rims are on, take each two felloes separately and drive the two ends that are farthest apart back from the shoulder about $\frac{3}{16}$ inch and saw through the joint where they butt together, then drive back to place again. This will leave the joints standing open about $\frac{1}{16}$ of an inch at the outside, which, when the tires are set, will come down firm and never cause the chins to gape open, which is the objection in so many wheels after running for a time.



DEVICE FOR DETERMINING THE PITCH AND GATHER OF WHEELS.

Now that the wheels are built the next move is to find the length, pitch and gather, with which to make the axles. It is done in this way: Make two triangular brackets, (see illustration) and spike them to the floor the exact distance apart that the tread of your wagon is to be plus the width of one tire. Take one pair of wheels, either front or hind, and stand them on the floor between the brackets and clamp the face of a spoke close up against the face of each bracket with the rims exactly parallel to each other. This leaves the spokes perfectly plumb from hub to floor; the principle on which all wagons depend for light draft and strength of wheel.

Now place the skeins in the hubs the way they are to set on the axle and take the distance between collars at bottom of skeins. To this length add twice the length of the hollow in one skein and you will obtain the exact length to cut the axle.

Now take a straight edge the length of the axle and place it in the skeins, from the point of one through and into the point of the other as they set in the holes. Next measure the opening between the straightedge and bottom of the skein and this will be the right amount to take off the bottom of axle to insure a plumb spoke.

Having found the length of axle and pitch of point, the next thing is to get the gather so that the wheel will run freely on the skein and bind neither shoulder nor nut. To get the proper gather, set half as much to the front as is taken from the bottom, that is, set the point of skein as much in front of the central line of the axle as half the amount taken from the bottom. This will set the wheels so that the bottom segment, say to a line drawn horizontally through the wheel about 12 inches from the floor, will stand perfectly parallel to each other with a plumb spoke, allowing them to run in a rut as much as 12 inches deep, without binding either side.

A wheel set in this manner will bind neither shoulder nor nut, but will play from one to the other, giving a perfectly free motion, and will wear the skein in no particular place, but all over alike.

This method of setting axles holds good, not only in new work, but also in repairing where you have to change the tread of a wagon, or put in a new pair of axles where a rig "don't run right" as is often the complaint.

Make the hounds and tongue according to your own fancy, but see that all hounds set perfectly square with the axles. By this, I mean so that the central line of draft (an imaginary line running from point to tongue across the exact centres of axles) will stand at perfect right angles to the trend of the axles. This done the wagon will run as true as a car.

I have abbreviated the foregoing remarks as much as possible, but the intelligent wagon builder, by a little study will see the philosophy of my plans and by putting some into practice, will turn out a wagon which, when well ironed and all joints laid in lead, will give good

service for 35 years with average care and will be of surprisingly light draft.

A great many of the craft imagine that a factory wagon cannot be successfully constructed by hand. The accompanying engraving shows a wagon built as described above, better in construction and equal in appearance, and may induce more of the craft to take up this branch of work to fill up spare time. This particular wagon sold for $65.00 alongside of various and much cheaper factory work.

Facts and Hints on Wagon Work.

Prize Article.—*Continued.*

GEO. E. BRIERLY.

The first point in making wheels is to select good material. The second is to have the wheel proportion proper. Be sure that your hub is large enough; it should be of such a size that it will allow the spoke to be in the hub as deep as it is wide, and to allow a space of $\frac{1}{8}$-inch between the spoke and the box. If the spokes touch the box they will soon become loose.

Always use a dodged hub. It is the best because the dodged spoke acts as a brace, and also the hub is not cut away so much in one place as when mortised straight. Drive the spokes so that the wheel will have $\frac{1}{8}$ dish. When the tire is set, the wheel should not pull to dish. If it does, the spokes are bent or they have moved in the hub. Be very careful in mortising the hub. First get the feet of the spokes all on taper, about $\frac{1}{8}$-inch for heavy wheels, and $\frac{1}{16}$ for light ones. When the mortise is made it should be exactly the same shape as the foot of the spokes, but $\frac{1}{8}$-inch smaller endways, so that it will drive tight. Of course you have to be guided by the material in the hub as to how tight you set the spokes to drive. Take a hammer of suitable weight, dip the spoke in some very thin glue and drive it into the mortise. Do not drive with a wooden mallet, because you cannot drive a spoke as tight with it. Do not set the spoke too tight, for when it is driven it will cause a shoulder to form on the back edge, which will allow the wheel to pull to dish and the spokes will not remain tight. The next move is to cut the spokes off the required length.

When cutting the tenon on the spoke do not cut it straight with the spoke, for if you do, when the rim is put on the joints will be hollow. Always cut the tenon a little back of but straight across the wheel. This will cause the joints to be high, so that when the wheel is screwed down on the platform it will bring the face of the wheel level. When the tenon is cut on the spoke, take a chisel and cut a shaving off the top and bottom. This will prevent it from splitting the rim. There should be a wedge driven in the tenon after the rim is on, to get it up to the shoulder of the spokes so as to enable the workman to cut the correct joint.

Axles have caused a great deal of trouble to a number of workmen. When the principle is understood, the laying out of axles is very simple. A wagon axle when set right without a load on, should measure $\frac{3}{8}$-inch less at ground than at the hub. When the wagon is loaded the wheels spread and are then on a plumb spoke, or in other words, the

A HAND-BUILT FARM WAGON.

front spoke (if the spokes are dodged) will be square with the center line of the axle. The wheels should also measure $\frac{1}{2}$-inch less in front than behind. This causes the wheel to run up to the shoulder all the time, and takes the strain off the nut. This is called the gather of an axle. If it is gathered too much it will cause the wagon to run hard. Some people have a notion that if a wagon talks loud it runs easier, but this is not the case.

To proceed to lay out an axle, take one side and edge up square and straight. Draw a line up one-quarter from the bottom of the axle. Find the center endways, which is 2 feet 9 inches when the track is 4 feet 8 inches, the axle piece being cut off 5 feet 6 inches long. From the centre measure half the width of the track, and from this point measure back the distance it is from the front of the front spoke to the back of the hub. This shows where the shoulder comes. Now from the bottom line at the shoulder mark place half the size of the arm. Do the same at each shoulder; then draw a straight line the length of the axle through these marks. This is the center line. Now from the center line at the length of the arm from the shoulder, measure $\frac{3}{16}$-inch down. This will cause the axle to be set right if the wheels had no dish. But wheels having dish, find out how much by placing a straight-edge across the wheel and measuring how far it is from the spoke to the straight-edge at the hub. Now take half of this and add to the $\frac{3}{16}$ already mentioned, and place down from the center line, and this will give the correct pitch. Find the size of the arm inside and mark it on the axle, not using the center line, but the line that is drawn from it. For the gather go $\frac{1}{8}$-inch forward of the center, and this will give about the right amounts. If both wheels have not the same dish, it will be necessary to lay them out separately. The foregoing is for new work where the two axles are put in at once. Of course for repair work the axle should be set so as to track with the other one. If you have only one brought to the shop, take the pitch of the broken one as near as possible, and make the new one the same. If the whole of the wagon is brought to the shop, you may set the axle the same as for new work, except for allowing the new axle to be longer between the shoulder than the other one, thus making it track right.

The foregoing remarks, if followed closely, will prove of considerable value.

The Shop Apprentice.

J. E. DAVIS.

This is a subject but little discussed, yet one which every craftsman should consider. Under the present circumstances, how long will it be before we cannot employ a journeyman at any price? Masters today are advertising and writing to their fellow craftsmen, trying to get a good floorman or a good man at the fire, simply because there are no young men encouraged to start in and learn the trade. I for one have been without a man for several months, for the simple reason that there are no horseshoers to be had. I have now taken in an apprentice to help me; I intend to teach him all I know, and when he becomes my superior, do not intend to envy him as a great many often do.

Always encourage an apprentice. Tell him not to try to do just as well as you do, but just a little better. Don't scowl,

but be cheerful and pleasant towards him always. You will gain in the end by such treatment.

There are a great many men in this country who would make excellent shoers if they were but given a chance and a little encouragement. Too often it is as it was with me when I first applied for a job. "Yes, you may go to work, but I won't give you even your board for the first three months." If a young man has any talent for the work he certainly can earn his board from the start. But if you cannot give him a job, tell him so and encourage him to try elsewhere.

I hope to see some opinion on this important subject from older and more experienced men in the craft.

REFERENCES:
FIRST NATIONAL BANK.
J. W. MOON, PRES. MANSON MFG. CO.
R. D. GIBSON, FINANCIER.

The Southside Smithy,
W. E. SCOTT, Prop.

SHOEING and CLIPPING, TOOL GRINDING and SHARPENING, BUGGY and WAGON REPAIRING.

Manson, Ill., ... 190

A Case of Interfering.

FRED RICKERT.

I had to shoe a four-year-old that interfered so badly that he tried my patience for six months. I made all the kinds of shoes that I had heard or read about, but he still interfered. At last I made shoes exactly to fit his feet with sharp toes and heels, put toe calks in the center of the shoes, brought the heels of the shoes right around the way his heels had grown, throwing them neither in nor out, and the horse has stopped interfering. After a drive of fifty miles, there was not a sign of a scratch.

No fixed rule can be laid down for shoeing. It is very essential, however, for the practical smith to be acquainted with the different methods and then apply them according to his judgment.

The Progressive Smith as a Business Man.—5.

The Blacksmith's Letterhead.

BILLY BUNTZ.

It is sound, business logic for the smith to have a neat, well-worded letterhead. It shows him to be progressive, business-like, established as a smith or dealer; it also advertises him by showing the work he does or the specialties he handles as a dealer.

Sample letterhead No. 1 speaks for itself. When a dealer or business man receives a letter written on such a head he quickly concludes that the writer is doing business on business principles, even though the financial agencies may give him only "a common, blacksmith rating." Any established smith can have references printed on his letter paper by obtaining permission from several of his business friends to use their names in such connection.

Sample No. 2 shows a letterhead where the smith himself is doing the selling, hence his references are not mentioned. Neither need he say anything about his smith shop, which he may run under some title, such as "The Southside Smithy," as though some one else was the owner—his main object being to show himself as an established dealer, rather than as the proprietor of a smith shop; or, where he conducts all his business on one floor, he may simply mention "Repair Shop In Connection." There is a subtle feeling among some folk that a blacksmith cannot sell to them as well or as cheaply as a full-fledged dealer, while some supply houses have inherited the belief that a regular dealer can sell more goods than could a "blacksmith dealer." However, many smiths are making a success—a good profit, by handling side-lines.

Other points which invite confidence or influence sales may also be shown on the blacksmith-dealer's letterhead—several years in business, goods extensively used and fully guaranteed, large sales, names of buyers or users, etc. The head may be of any convenient size and embellished by an appropriate cut, such as a picture of a wagon, sleigh, plow, gas engine; or, for a repair shop, by an anvil, clipper or horseshoe.

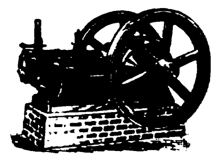
Where the smith is well established as a smith or dealer, he may glean profit by writing a personal letter to farmers and others in his vicinity or adjoining territory, calling their direct attention to his excellent facilities for shoeing or clipping, handling the repair of tools and implements, building wagons, etc.; or, he may enumerate such specialties as he is handling—gas engines, plows, buggies—and send with his letter a circular describing them. Manufacturers are usually glad to supply free printed matter to smiths who are handling their goods, as well as cuts for letterheads or advertising in home newspapers. Some companies even furnish free letterheads, although if the smith devises his own it is likely to meet his needs more directly.

While it is sometimes the case that the smith is not much "on the write," usually because his fingers have become thickened or stiffened, thereby making a pen somewhat light in weight for him to handle conveniently, it is true, nevertheless, that even "scoop-shovel" writing or a letter which is printed or painted is likely to bring custom on repair work, as it shows the writer to be a practical mechanic, rather than "a pretty letter-writer." However, where the smith has not the time to do the writing himself or wishes to solicit trade through the mail on a considerable scale, he may turn the job of writing over to his son or to a bright apprentice boy, writing out a copy first for him to follow, so the letter will contain practical, straight-forward points. Soliciting letters may all contain the same wording, as a letter which

SPECIALTIES
WINDMILLS,
TREADS,
SWEEPS,
GAS ENGINES,
STEAM ENGINES.
SLEIGHS,
WAGONS,
PLOUGHS,
CULTIVATORS,
FEED CUTTERS,
CHOP MILLS,
WOOD SAWS.

ESTABLISHED IN 1890.

BEST KNOWN DEALER IN JOHNSON COUNTY.
Can Supply Anything You Want.



W. E. SCOTT,
FARM MACHINERY.

MANSON, ILL., ... **190**

will appeal to one recipient will likely appeal to all.

To facilitate letter-writing, the smith will find that the most appropriate present for his son is a typewriter, as he can conduct his father's correspondence, and at the same time educate himself in practical business. An enthusiastic daughter also makes a good correspondent. Any boy can learn to run a typewriter in a few weeks, and in the course of a little time be able to take dictation, thereby answering the mail in his father's own words. At the same time, the typewriting experience will be useful to the son in after years, as he can use a typewriter in any line of business. A good typewriter may be bought for as low as $25 or $35, while some of the standard machines come as high as $125. However, a machine like the "Blickensderfer" or "Chicago," at moderate price is admirably adapted to handling smith shop correspondence.

A Good Brick Forge.

W. W. HERRING.

The following is the plan for building about as nice a forge as I ever saw. Commence the forge as large as you want it, building it to the height of the bed just as you would any brick forge. From there on continue the forge up six or eight feet high, the size of the hearth. Make an opening in front high enough to take in a wagon tire, and wide enough to give room to get the work in. There can be an opening at the back to let the work go through. Taper the forge to three bricks square and run the flue above the building, and you will never be bothered with any smoke or dust in the shop.

Table of Tools and Parts Made from Crucible Steel.—*Continued.*

Giving Percentage of Carbon They Should Contain, Temper Colors to Which They Should be Drawn and Degrees of Heat for Producing Different Temper Colors.

COMPILED AND ARRANGED BY JOSEPH V. WOODWORTH.

Tool.	Carbon, Per Cent.	Color.	Deg. of Heat. F.
Hammer, peen	1.15	Brown yellow	500
Hammer, pneumatic	0.60 to 0.70	Brown yellow	500
Hammers and drop dies	1.15	Spotted-red-brown	510
Half-round bits	1.22 to 1.25	Straw yellow	460
Hand springs	1.28	Purple blue	535
Hand tools	1.25	Light yellow	440
Hand plane irons	1.10 to 1.20	Brown yellow	500
Hatchets	1.15 to 1.22	Brown yellow	500
Hobs for dies	0.80 to 0.90	Straw yellow	460
Inserted saw teeth	1.25	Straw yellow	460
Ivory cutting tools	1.10	Very pale yellow	430
Jaw, chuck	0.85 to 0.90	Brown yellow	500
Jaw for pipe machine	1.15	Brown yellow	500
Jaw, gripping	0.85 to 0.90	Straw yellow	460
Jaw pieces	0.95 to 1.05	Purple blue	535
Jaw, vise	0.85 to 0.90	Spotted red-brown	510
Jaw, wire puller	1.10 to 1.18	Straw yellow	460
Jaws	0.73 to 0.78	Straw yellow	460
Key for hammer	0.75 to 0.80	Blue	549
Knife, belt	0.80 to 0.85	Spotted red-brown	510
Knife, blade	1.00	Brown yellow	500
Knife, corn	0.80 to 1.00	Brown yellow	500
Knife, carver	1.00	Brown yellow	500
Knife, draw	1.20 to 1.22	Straw yellow	460
Knife, envelope	1.20 to 1.22	Very pale yellow	430
Knife, hog	1.15	Straw yellow	460
Knife, machine	1.20 to 1.22	Brown yellow	500
Knife, paper	1.15	Straw yellow	460
Knife, putty	0.90 to 1.00	Blue	549
Knife, scarfing	0.90 to 0.95	Brown yellow	500
Knife, shear	0.85 to 0.90	Straw yellow	460
Knife, straw cutter	0.80 to 0.90	Brown yellow	500
Knife, whittler	1.15	Brown yellow	500
Knife, wood working	1.15 to 1.20	Straw yellow	460
Lathe tools for brass	1.15 to 1.20	Very light yellow	420
Leather- cutting dies	1.22 to 1.28	Straw yellow	460
Lining for brick dies	1.20 to 1.25	Straw yellow	460
Mandrels	1.05 to 1.10	Dark yellow	490
Milling cutters for brass	1.20 to 1.25	Very light yellow	420
Milling cutters	1.20 to 1.25	Straw yellow	460
Moulding and planing tools	1.10 to 1.15	Dark purple	550
Needles	1.20 to 1.25	Dark purple	550
Paper cutters	1.25	Very pale yellow	430
Parts subject to shock	1.05 to 1.10	Very dark yellow	505
Penknives	1.18	Straw yellow	460
Percussion tools for metal	0.85 to 0.95	Brown yellow	500
Planer tools for iron	1.05	Straw yellow	460
Planer tools for steel	1.15	Very pale yellow	430
Planer tools for stone	0.70 to 0.80	Brown yellow	500
Planer tools for wood	1.15	Straw yellow	460
Pliers	0.85 to 0.95	Brown yellow	500
Press dies for brass	1.20	Light purple	530
Press dies for cold rolled stock	1.25	Brown yellow	500
Press dies for sheet metal	1.15	Straw yellow	460
Press dies for leather	1.25	Straw yellow	460
Press dies for paper	1.25	Brown yellow	500
Punch, blacksmith	0.80 to 0.85	Brown yellow	500
Punch, cartridge shell	1.20 to 1.22	Straw yellow	460
Punch, file blank	1.20 to 1.22	Blue	549
Punch, hot work	0.85 to 0.90	Brown yellow	500
Punch, oil cloth	0.85 to 0.90	Brown yellow	500
Punch, railroad track	1.85	Blue	549
Punch, skate blade	0.85 to 0.90	Blue	549
Punch, washer	0.80 to 0.88	Blue	549
Reamers, Hand, all kinds	1.20 to 1.23	Straw yellow	460
Rock drills	1.10 to 1.18	Straw yellow	460
Saws, band	0.68 to 0.75	Light purple	530
Saws, circular	0.80 to 0.90	Straw yellow	460
Saws, cross-cut	0.85 to 1.00	Brown yellow	500
Saws for sawing steel	1.60	Light purple	530
Saws, gang	0.90 to 1.00	Straw yellow	460
Saws, mill	1.25 to 1.30	Spotted red-brown	510
Saws for wood	1.15	Dark blue	570
Saws for bone and ivory	1.10	Dark purple	550
Scarfs	1.20 to 1.25	Brown yellow	500
Scrapers, tube	1.20 to 1.22	Brown yellow	500
Scrapers, for brass	1.23	Very pale yellow	430
Scrapers	1.23	Very light yellow	420
Screw drivers	0.95 to 1.05	Dark purple	550
Screw-cutting dies	1.15 to 1.20	Straw yellow	460
Shear blades	0.90 to 1.10	Dark yellow	490
Shell end mills	1.05 to 1.10	Straw yellow	460
Shell reamers	1.10 to 1.20	Brown yellow	500
Shell thread dies	1.15 to 1.25	Dark yellow	490
Slight turning tools	1.20 to 1.25	Very pale yellow	430
Small milling cutters	1.20 to 1.25	Straw yellow	460
Springs	1.15 to 1.23	Very dark blue	601
Springs	1.18 to 1.25	Dark purple	550
Steel-engraving tools	1.20 to 1.28	Very pale yellow	430
Stone-cutting tools	0.95 to 1.05	Straw yellow	460
Taps and Dies, Hand, all kinds	1.20 to 1.25	Straw yellow	460
Taps, nut	1.15	Straw yellow	460
Taps, spindle	1.20 to 1.22	Straw yellow	460
Threading dies for brass	1.18 to 1.20	Light yellow	440
Tools for wood to be filed	1.05	Purple blue	535
Tools for wood, not to be filed	1.18	Spotted red-brown	510
Tool for reaming inside of guns	1.05 to 1.12	Very pale yellow	430
Tool for turning hard rubber	1.05	Straw yellow	460
Tools for cutting soft stock	0.80 to 1.00	Very light yellow	420
Twist drills	1.20	Brown yellow	500

Table of Temper Colors of Steel.

Very light yellow	420
Faint yellow	430
Straw color	460
Dark straw	470
Dark yellow	490
Brown yellow	500
Spotted red-brown	510
Purple	530
Blue	550
Full blue	560
Polish blue	580
Dark blue	600
Pale blue	610
Blue tinged with green	630
Bright red in dark	725
Red hot in twilight	884
Red visible by day	1077

HEATS SPARKS WELDS

A light heart is a big personal asset.

Drive your business; don't let it drive you.

A mule is very often like the man who "knows it all."

A bright sign over the shop door is often a trade winner.

Living up to your New Year resolutions? What, forgotten them?

Rumors of war in the far East, but wheels hum and anvils ring on unmindful.

Now's the time, when not over busy, to think out schemes for increasing your spring trade.

The days lengthen as the cold strengthens—an old saying but a true one at this time of year.

Sometimes your customer thinks he knows more about it than you. Treat these kind with tact.

Does your neighbor smith take a good craft paper? Tell him about your favorite journal and get him to subscribe.

That 'prentice of yours may yet be a master smith. Your craft pride tells you to teach him all you can. Do you?

A black eye from smut of the forge is a badge of industry, but a black eye from underhand dealings disfigures for years.

A good old world is ours, after all. Most of us contribute some little share towards its betterment and cheerfulness.

Down and out. That's the case with many a mechanic who hasn't the backbone to ask as much as his services are worth. Cultivate backbone.

Did you ever try washing your coal to improve it? Much depends upon its quality, and considerable of the sulphur and dross can be eliminated by washing.

Are you learning anything from the experience of others as given in the prize articles on wagon work in the front of the paper? Good practical experience.

Cause and effect—The farrier who is shoeing interfering horses has a good chance to observe its workings—and to put his close observations to practical use, too.

Abraham Lincoln once said he owed his success largely to the fact that he made it a rule always to be about five minutes early in getting to work and in keeping appointments.

Don't forget that letters or printed circulars mailed to prospective customers to remind them of your line of business, are excellent advertising. They stamp you as progressive and up to date.

A good razor, also a pocket knife, have been added to the list of premiums given for American Blacksmith subscriptions. See the announcement in the advertising pages of this number and the next.

A prize for the best article on the advantages of gas engine power in the blacksmith shop! Have you had any experience with an engine? Yes? Then you have a chance for a prize. There's more than one offered.

Don't think a customer a dead beat because he is "slow pay." Treat such with tact and persistence, and above all, with good nature. Get his promise, or perchance his note, and follow either up closely.

'Tis good to know of men whose sole aim is not personal gain. Such a man is John Mitchell, of the United Mine Workers, who in convention recently used his authority to frown down an attempt to increase his salary as president.

What are the blacksmiths in your neighborhood doing? Send in notices of any meetings that are held, for publication, so that the blacksmith world may know what you are doing. Have you raised prices recently?

Look for the rat holes in your business and stop them up. The less money you lose through any holes the more you make. Bad debts, waste of material "soldiering" employees—can you discover any such holes to stop up?

Daily we hear of the lack of apprentices while the demand for good smiths grows constantly. What are you doing to induce promising young men to take up our good old vocation? What are you doing to keep up the standard of the craft?

Has any kink described in these columns helped you a bit? There are probably many little short cuts which you have learned and which would help brother smiths in turn, especially those just beginning. Write 'em out and mail to the editor.

Look out that the boogie doesn't catch you. The boogie takes many forms—one of the most common is lack of progressiveness; getting in a rut, in other words. What are you doing to wake up trade, to improve your shop methods, to keep up to date?

No man ever gets to the point where study cannot benefit him. Twentieth century libraries, night schools, and correspondence schools place opportunity within the reach of all. But when one studies, he should have some end in view, so as to spend his time to the best advantage.

Get together with the smiths of your town or county and agree on a scale of prices which will give you all a proper living. Let the skilled workman get better prices than the scale if he can command them, but let none charge below the scale. Write the American Association for plans how this may be done.

The best way is not to talk about your neighbor's poor jobs, but to boost your own reputation by skilful work. Actions speak louder than words, and running down a competitor is too often but a plain indication of jealousy. There is no better advertisement than turning out first-class work and attending strictly to business.

A short talk upon any one of the questions asked in this issue under the heading "Queries, Answers, Notes," would be most acceptable. Send it to the editor, who will see that it is correctly printed. Many readers say that department is one of the most interesting in the paper. Perhaps you could help make it more interesting if you took more interest in it.

In West Virginia horse murder is punishable under statute by a penitentiary sentence of from one to five years. A blacksmith there while shoeing a horse a few days ago became enraged at the animal because it playfully nipped him on the hip. Seizing a hammer he killed the horse with a blow on the head. Such an offence deserves the full penalty of the law.

Asleep. Are you among those blacksmiths and wheelwrights who have not awakened to the fact that they are working for starvation wages fairly, that they can secure better prices if they will but put forth the effort, and that each time they pass by an opportunity to organize and co-operate with brother craftsmen for better prices, just so often do they deprive them selves and their families of many of the comforts and conveniences of life? Not only may a man enthusiastically embrace an opportunity to organize with his brother craftsmen for mutual benefit, but he can with profit be the one to start such a movement in his locality.

Any question you would like to ask about your work? Perhaps you want a little advice about some trouble that horse has; perhaps you don't know just what size pulleys to use with that new gas engine; or maybe it is some question about treating that tool steel which is troubling you. At any rate, send in your query, and if The American Blacksmith cannot answer, it will try to find some one with experience on that particular point who can help you. But be sure to explain the trouble clearly and fully.

Tom Tardy's face brightened visably when we strolled into his shop last Friday. "You can help me," he said. Tom has been shoeing for ten and twenty lately, getting poorer and poorer every day. From some unknown source he had conceived an idea, and so we found him trying to figure out his profit at the prices he charged. "There's what it costs for a set of shoes," pointing to his figures on a pine board, "and that's for the nails. That leaves a good profit, and I can't figure out just where the trouble is." Tom went on to tell us how he had been cutting his prices down and down, but without getting any greater amount of trade. At last he had realized that something must be done. Hence the figures.

"Where's the trouble?" he asked. We mentioned a few items of expense such as coal, rent, toe calks, oil for his lamp, adding, "you had to pay something, didn't you, Tom, to have the place fixed up after your little fire here a month or so ago? That old bellows is about ready to fall to pieces, and you'll have to repair your chimney soon if you don't want it coming down on your head. You can't buy groceries with the same money it takes for those expenses, can you, Tom?" Our friend threw down his board and figures with a sound that was half-way between a grunt and a groan, but he seemed much relieved when we promised to help him figure out his costs some day. "Never was much good at 'rithmetic," our worthy blacksmith friend said as we parted.

American Association of Blacksmiths and Horseshoers.

A Movement for Better Prices.

The question of prices for work is one that every live shop-running blacksmith and wheelwright is giving a great deal of thought to in these days of high prices for material and living necessities. It can be taken for granted that there are few sections of the country where blacksmiths receive as much money as they should in proportion to their skill and labor.

To correct this condition of things, the cause must be found. The reason why one shop will not raise its prices when the price of supplies goes up, is simply through fear of losing patronage to other shops. The price-cutting evil brings neighboring craftsmen to work at less than a living profit, the ones who profit being the customers themselves. Occasionally we meet with smiths who have figured out just how much they must charge in order to make a proper living from their work, and who refuse to work for less, and occasionally with others who are not afraid to advance their prices, but it is a fact that the large majority of smiths stand in too great fear of losing patronage by putting up prices, unless their neighbors agree to do likewise, and even then there is no telling when the prices will be cut down again.

The solution of the difficulty lies in getting all shops in a given locality to co-operate in earnest, to organize themselves into a body for mutual protection and interests. It goes without saying that organization is the order of the day. All successful crafts are organized fully. Blacksmiths should see that their interests are identical one with another, and every year they pass in craft jealousy and price cutting means hundreds of dollars out of the pockets of each one. Right-minded customers agree that blacksmiths are not getting what they should; dealers and supply houses would welcome a stand for better prices on the part of the smith. The greatest thing to be overcome is the fear and jealousy of one shop for its neighbor.

The solution of the difficulty lies, therefore, in organization. Let blacksmiths realize that their neighbors are brother wage-earners, with interests and desires the same as their own, and then let them come together, form an association, fix prices and uphold them. One blacksmith, who is progressive and energetic, can start the ball rolling in his county or town. It is a simple matter to calculate how much more money he would earn from even a small raise in prices.

Blacksmiths who are interested should write to the American Association of Blacksmiths and Horseshoers, for plans for forming local city or county associations, under the auspices of the American Association, at Buffalo, N. Y. These plans are furnished free of charge to blacksmiths. They outline how a strong working association may be formed, how the members can be forced to stick to the prices agreed upon by the local county association, and, further, how the blacksmith who takes up the work of educating and organizing his county can make enough money to pay him for the time he may spend on the work. Blacksmiths standing well in any county are invited to write for full particulars. The American Association at Buffalo would like to see a local association in every county of every state in the land. A great many blacksmiths in various sections are already engaged on the work.

The New York State Lien Law Bill.

On January 6th, a bill "to amend the lien law, relative to liens on animals and vehicles for labor done and materials furnished" was introduced in the New York State legislature by Senator George A. Davis, at the request of The American Blacksmith Company and the American Association of Blacksmiths and Horseshoers. No stone must be left unturned to get this bill passed. The Association has written to several thousand blacksmiths in various sections of New York State requesting them to write at once to the Senators and Assemblymen representing them at Albany and urge them to vote for the bill. We are sure that every smith who has thus been notified will do this to help the bill through. The blacksmiths and horseshoers of McClure, Gulf Summit, and Deposit all signed a petition prepared by Mr. C. Hall, Jr., of McClure, N. Y., and sent it to the Assemblyman from their District. We are glad to see such energy as this in helping the Lien Law bill along—the idea is an excellent one. The petition is printed here:

Whereas, the undersigned, understanding that there has been a bill presented at this Session of the State Legislature, providing for a Mechanics' Lien for Blacksmiths and Horseshoers of the State, upon articles upon which repairs are made, and shoeing done to animals, etc., enabling them to recover pay for work done by them as mechanics, which now in many cases is lost by them, and believing that the proposed bill is a necessity and a move in the right direction for this class of tradesmen,

We, therefore, respectfully ask you to give this bill your favorable consideration, and do all that you consistently can in procuring its passage as a law upon the Statute Books of the State, individually, as well as using your influence in having other legislators give it the consideration which its importance deserves.

Let every blacksmith and wagon builder in New York State sit down the very day he sees this article, and write to his representatives at Albany, if he has not already done so, urging their support of the bill. Write at once—there is no time to be lost. Let him also tell his brother smiths to do the same thing.

Clarion County Association.

The blacksmiths of Clarion County, Pa. recently held a meeting at Bethlehem and organized their county under the American Association of Blacksmiths and Horseshoers. Fifteen joined at that time, electing Mr. J. W. Fleming, East Brady, Pa., as president, and Mr. W. M. Armagost, of Rimersburg, Pa., as treasurer. The scale of prices was not fully decided upon, but will be brought up again at the next meeting.

The Railroad Blacksmith Shop.—16.

W. B. REID.

Miscellaneous Work.

Setting locomotive valves generally implies the adjusting of the eccentric rods by the blacksmith. To do this accurately without disturbing the original set and outline of the rod requires considerable expertness on the part of the smith. The method usually followed is for the machinist to tram the rod with short tram or gage (C, Fig. 64) upon its straight part, lengthening or shortening as required. With straight or slightly bent rods this answers the purpose. But when the rods have considerable offset, as in Fig. 64, the use of a long tram, gaged entirely outside of all the points of operation is necessary to secure accurate results. (B, Fig. 64). This will appear very plain from a moment's glance at the sketch.

It is very obvious that lengthening or shortening the rod inside the points of the short tram will to a corresponding degree affect the distance between the end of rod and straight edge. See A, Fig. 64. To adjust this accurately to original position it would then be necessary to change the offsets slightly at points of bends. This being done outside the points of small tram, leaves us really ignorant of the true condition of the rod. By using the long tram, on the contrary, and preserving the same distance at A, the rod can be adjusted with positive accuracy. The use of double tram marks is also commendable in adjusting eccentric rods, securing

greatest accuracy and dispensing with the use of the straight-edge for side measurements. Simple as these remarks may appear, the writer considers them of some importance, since, in many railroad shops he has found the short tram used alike on straight and bent rods indiscriminately.

While upon the subject of eccentric rods, a word in reference to the forging of the fork or jaw for same, may be of interest. To overcome the obvious weakness of a cross grain iron through the line, E, Fig. 64, when forged in the solid, these jaws are often welded as shown at F, G, and H, Fig. 64. Though this may overcome the weakness mentioned, the welds themselves are equally vulnerable.

The entire welded surfaces being removed at machine in finishing the jaw, renders any advantage thus secured, of a very doubtful quantity. The writer has often been conscious of unnecessary waste of time in making the eccentric rod, reach-rod and other similar jaws in this way, when required to do so. By making them in the solid from mild steel a much superior article can be produced in a third of the time.

At Fig. 65, A and B, is shown a jaw forged in this way. A represents the stock, of mild steel, checked down with triangular fuller, for blade end, and a round or rectangular hole punched, to form the jaw, at opposite end. B shows same with the end drawn down—the stock cut off to right length, and the jaw cut out. The whole operation can easily be done in one or two heats at most; and the job completed at anvil in a comparatively short space of time.

If mild steel is not available, a substantial jaw can be forged in the same way, providing the iron is solidified by working with welding heats throughout. Made either way, by far the greater proportion of breakage in iron jaws occurs at the pin hole E, Fig. 64, the result of the iron not having been finished with welding heats at this point. When made of mild steel all these natural defects are avoided and a much superior job, in every way, secured.

Spring equalizers frequently become so warm in the fulcrum hole as to require re-enforcement of the stock at this point. Fig. 65, C, shows the equalizer scarfed to receive a patch, in dove-tail fashion. This is done by making two slanting incisions with chisel in opposite directions, raising the cut sections upward as shown. The stock in intervening space is then driven downwards restoring the hole to proper shape and proportion, the deficiency thus occasioned being supplied by the patch on outside. In repairing in this way, the mistake is often made of putting the patch in straight, from side as at E, Fig. 65. The result is the piece does

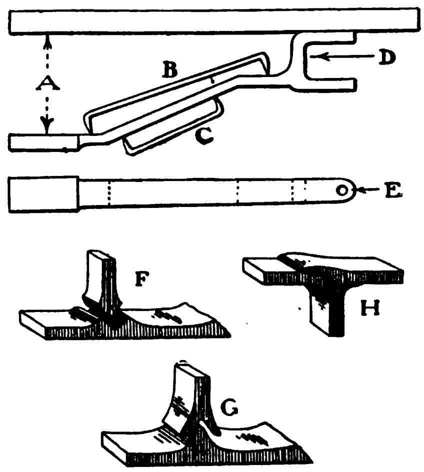


Fig. 64. ADJUSTING ECCENTRIC ROD AND FORGING THE JAW OF A ECCENTRIC.

not fit snugly and becomes still more loose by the expansion of the equalizer in heating; the dirt thus finding an easy entrance, makes a good weld impossible. With the patch from ¾ to 1 inch longer than the scarfed cavity, and bent as shown at D, Fig. 65, it will enter easily. And, when driven down at a white heat, under steam hammer, will adjust itself very tightly into place. Heated slowly, to allow the heat to penetrate the iron, a substantial weld can then be effected at the anvil with sledges, the superfluous stock being trimmed from the edges, and the surface smoothed and levelled by a few blows of steam hammer.

During the scarfing and welding operations a flat mandril has, of course, to be inserted in the fulcrum hole to keep it in shape, and to afford a solid resistance to the impact of the hammer. The smaller spring hanger holes at the ends of the

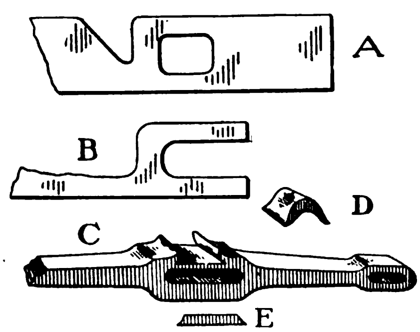


Fig. 65. A B—FORGING JAW FROM ONE PIECE. C—REINFORCING FULCRUM HOLE OF A SPRING EQUALIZER.

equalizer can be repaired in the same way with equal facilty, either upon the face or side. In the hands of competent workmen, many forgings by such means can be restored to service in good shape, saving the substitution of new and expensive forging, and also saving in time, which is an important factor.

(To be continued.)

Making a Polishing Wheel.

T. E. LARSON.

For this purpose I use old felt boots, which can be obtained for little or nothing. Each boot will make two plys. Three pairs of boots will make one wheel about 3 by 7. Put iron plates on each side about ⅛ of an inch thick, and about one inch smaller than the wheel. Bolt them together. The wheels can be made any thickness desired. To obtain a smooth surface put the wheel on emery stand shaft, use a chisel like those used for wood lathes, and hold up to the wheel on a rest. The wheel must have good speed. This makes fine polishing wheels, as they are soft and will not bump or break.

Correcting the Dish of Wheels.

FRED RICKERT.

Three years ago I rebuilt two hind wheels on a 4-inch lumber wagon. They had been rebuilt four different times before, but would always dish wrong and break down. I fixed them with ½-inch dish and set the ¾-inch tires back on them. They had ¾-inch dish when they left the shop; in three weeks they came back dished wrong again. I supposed I knew all about a wagon wheel, having built them for years, but I now found out differently and began to study how to keep the dish in a wheel. I drove the spokes with ¼-inch dish, bevelled the felloes $\frac{1}{16}$ inch to the outside edge, gave the tires ½ inch draw, and set them again. Those wheels are in use today. I have set the tires on them once since. The wheels have now ½ inch dish and hold up 3,000 to 4,000 feet of lumber.

I have now come to the conclusion that a wheel built smaller on the outside edge will never dish wrong. I have tried a number of buggy wheels that were dished wrong by dishing them right, turning rims and tires, and they hold the dish right along. Of course a smith should see that his wheel is not rim bound, for a rim bound wheel is liable to dish any way at all.

An Approved Tuyere for Large Forges.

The line engraving presented herewith shows a form of tuyere, grate and housing endorsed by Mr. Robert Henderson, before the Buffalo meeting of the National Railroad Master Blacksmiths. His recommendation is for a blast box 6 by 6 inches and 9 inches deep, for heavy work, with drop grate on top in accordance with the figure, and a 3½ to 4-inch

blast pipe. For lighter work a box 5 by 5 inches, and 8 inches deep is recommended, with top of box 10 inches below top of forge, and a 3-inch blast pipe. A box of this size will meet all the requirements of light or medium work.

A Treatise on Horseshoeing.*

JOHN W. ADAMS V. M. D. LECTURER ON SHOEING, UNIVERSITY OF PENNSYLVANIA.

Introduction.

Bad and indifferent shoeing frequently leads to diseases of the feet and to irregularities of gait which may render a horse unserviceable. It is important, therefore, to consider the principles involved in shoeing healthy hoofs. In this discussion of the subject it is intended to give the intelligent horse owner sufficient information, based on experience and upon the anatomy and physiology of the foot and leg, to enable him to avoid the more serious consequences of improper shoeing.

The Foot.

Let us first examine the mechanism of the foot and learn something of its structure and of the natural movements of its component parts, that we may be prepared to recognize deviations from the normal and to apply the proper corrective.

Gross Anatomy of the Foot.

BONES.—The bones of the foot are four in number, three of which—the long pastern, short pastern, and coffinbone—placed end to end, form a continuous straight column passing downward and forward from the fetlock joint to the ground. A small accessory bone, the navicular, or "shuttle" bone, lies crosswise in the foot between the wings of the coffinbone and forms part of the joint surface of the latter. The short pastern projects about 1½ inches above the hoof and extends about an equal distance into it.

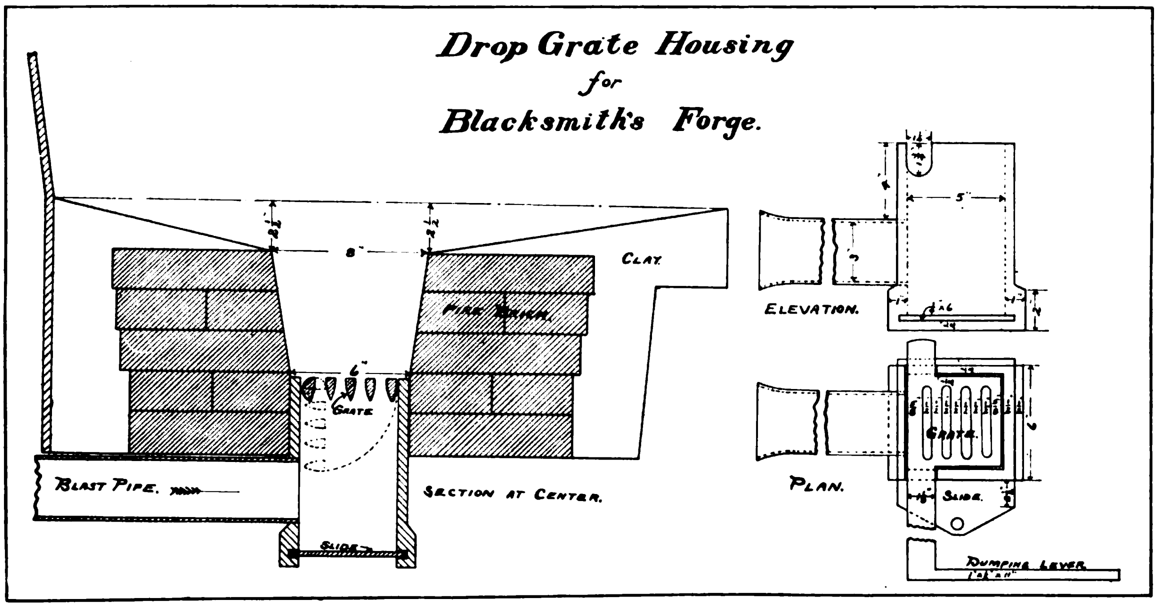
HINGE JOINTS.—The pasterns and coffinbone are held together by strong fibrous cords passing between each two bones and placed at the sides so as not to interfere with the forward and backward movement of the bones. The joints are therefore hinge joints, though imperfect, because, while the chief movements are those of extension and flexion in a single plane, some slight rotation and lateral movements are possible.

TENDONS AND FLEXORS.—The bones are still further bound together and supported by three long fibrous cords or tendons. One, the extensor tendon of the toe, passes down the front of the pasterns and attaches to the coffinbone just below the edge of the hair; when pulled upon by its muscle this tendon draws the toe forward and enables the horse to place the hoof flat upon the ground. The other two tendons are placed behind the pasterns and are called flexors, because they flex, or bend, the pasterns and coffinbone backward. One of these tendons is attached to the upper end of the short pastern, while the other passes down between the heels, glides over the under surface of the navicular bone, and attaches itself to the under surface of the coffinbone. These two tendons not only flex, or fold up, the foot as the latter leaves the ground, during motion, but at rest assist the suspensory ligament in supporting the fetlock joint.

FOOT-AXIS.—The foot-axis is an imaginary line passing from the fetlock joint through the long axes of the two pasterns and coffinbone. This imaginary line, which shows the direction of the pasterns and coffinbone, should always be straight—that is, never broken, either forward or backward when viewed from the side, or inward or outward when observed from in front. Viewed from one side, the long axis of the long pastern, when prolonged to the ground, should be parallel to the line of the toe. Viewed from in front, the long axis of the long pastern, when prolonged to the ground, should cut the hoof exactly at the middle of the toe.

Raising the heels or shortening the toe not only tilts the coffinbone forward and makes the hoof stand steeper at the toe, but slackens the tendon that attaches to the under surface of the coffinbone, and therefore allows the fetlock joint to sink downward and backward and the long pastern to assume a more nearly horizontal position. The foot-axis, viewed from one side, is now broken forward; that is, the long pastern is less steep than the toe, and the heels are either too long or the toe is too short. On the other hand, raising the toe or lowering the heels of a foot with a straight foot-axis not only tilts the coffinbone backward and renders the toe more nearly horizontal, but tenses the perforans tendon, which then forces the fetlock joint forward, causing the long pastern to stand steeper. The foot-axis, seen from one side, is now broken backward—an indication that the toe is relatively too long or that the heels are relatively too low.

LATERAL CARTILAGES AND PLANTAR CUSHION.—The elastic tissues of the foot are pre-eminently the lateral cartilages and the plantar cushion. The lateral cartilages are two irregular four-sided



Drop Grate Housing for Blacksmith's Forge.

*Department of Agriculture Bulletin.

plates of gristle, one on either side of the foot, extending from the wings of the coffinbone backward to the heels and upward to a distance of an inch or more above the edge of the hair, where they may be felt by the fingers. When sound, these plates are elastic and yield readily to moderate finger pressure, but from

Fig. 1. A RUBBER TIRE SETTER. WHEEL IN PERPENDICULAR POSITION.

various causes may undergo ossification, in which condition they are hard and unyielding. The plantar cushion is a wedge-shaped mass of tough, elastic, fibro-fatty tissue filling all the space between the lateral cartilages, forming the fleshy heels and the fleshy frog, and serving as a buffer to disperse shock when the foot is set to the ground. It extends forward underneath the navicular bone and perforans tendon, and protects these structures from injurious pressure from below. Instantaneous photographs show that at speed the horse sets the heels to the ground before other parts of the foot—conclusive proof that the function of this tough, elastic structure is to dissipate and render harmless violent impact of the foot with the ground.

PODODERM (FOOT SKIN).—The horn-producing membrane, or "quick," as it is commonly termed, is merely a downward prolongation of the "derm," or true skin, and may be conveniently called the pododerm (foot skin). The pododerm closely invests the coffinbone, lateral cartilages, and plantar cushion, much as the sock covers the human foot, and is itself covered by the horny capsule, or hoof. It differs from the external, or hair skin in having no sweat or oil glands, but, like it, is richly supplied with blood vessels and sensitive nerves. And, just as the derm of the hair skin produces upon its outer surface layer upon layer of horny cells (epiderm), which protect the sensitive and vascular derm, so, likewise, in the foot the pododerm produces over its entire surface soft cells, which, pushed away by more recent cells forming beneath, lose moisture by evaporation and are rapidly transformed into the corneous material which we call the hoof. It is proper to regard the hoof as a greatly thickened epiderm, having many of the qualities possessed by such epidermal structures as hair, feathers, nails, claws, etc.

The functions of the pododerm are to produce the hoof and to unite it firmly to the foot.

There are five parts of the pododerm, easily distinguishable when the hoof has been removed, namely: (1) The perioplic band, a narrow ridge from one-sixteenth to one-eighth of an inch wide, running along the edge of the hair from one heel around the toe to the other. This band produces the perioplic horn, the thin varnish-like layer of glistening horn, which forms the surface of the wall, or "crust," and whose purpose seems to be to retard evaporation of moisture from the wall. (2) The coronary band, a prominent fleshy cornice encircling the foot just below and parallel to the per-

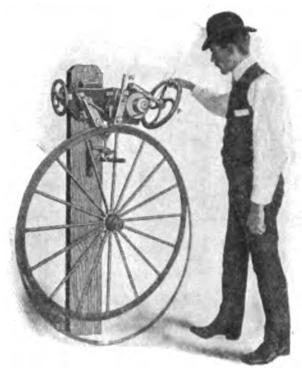


Fig. 2. DRAWING UP THE TIRE.

ioplic band. At the heels it is reflected forward along the sides of the fleshy frog to become lost near the apex of this latter structure. The coronet produces the middle layer of the wall, and the reflected portions produce the "bars," which are, therefore, to be regarded merely as a turning forward of the wall. (3) The fleshy leaves, 500 to 600 in number, parallel to one another, running downward and forward from the lower edge of the coronary band to the margin of the fleshy sole. They produce the soft, light-colored horny leaves which form the deepest layer of the wall, and serve as a strong bond of union between the middle layer of the wall and the fleshy leaves with which they dovetail. (4) The fleshy sole, which covers the entire under surface of the foot, excepting the fleshy frog and bars. The horny sole is produced by the fleshy sole. (5) The fleshy frog, which covers the under surface of the plantar cushion and produces the horny frog.

HORNY BOX, OR HOOF.—The horny box, or hoof, consists of wall and bars, sole and frog. The wall is all that part of the hoof which is visible when the foot is on the ground. As already stated, it consists of three layers—the periople, the middle layer, and the leafy layer.

BARS.—The bars are forward prolongations of the wall, and are gradually lost near the point of the frog. The angle between the wall and a bar is called the "buttress." Each bar lies against the horny frog on one side and incloses a wing of the sole on the other, so that the least expansion or contraction of the horny frog separates or approximates the bars, and through them the lateral cartilages and the walls of the quarters. The lower border of the wall is called the "bearing edge," and is the surface against which the shoe bears. By dividing the entire lower circumference of the wall into five equal parts, a toe, two side walls, and two quarters will be exhibited. The "heels," strictly speaking, are the two rounded soft prominences of the plantar cushion, lying one above each quarter. The outer wall is usually more slanting than the inner, and the more slanting half of a hoof is always the thicker. In front hoofs the wall is thickest at the toe and gradually thins out towards the quarters, where in some horses it may not exceed one-fourth of an inch. In hind hoofs there is much less difference in thickness between the toe, side walls, and quarters. The horny sole from which the flakes of old horn have been removed, is concave and about as thick as the wall at the toe. It is rough, uneven, and often covered by flakes of dead horn in process of being loosened and cast off. Behind, the sole presents an opening into which are received the

Fig. 3. COMPRESSING THE RUBBER.

bars and horny frog. This opening divides the sole into a body and two wings.

The periphery of the sole unites with the lower border of the wall and bars through the medium of the white line, which is the cross section of the leafy

horn layer of the wall, and of short plugs of horn which grow down from the lower ends of the fleshy leaves. This white line is of much importance to the shoer, since its distance from the outer border of the hoof is the thickness of the wall, and in the white line all nails should be driven.

THE FROG.—The frog, secreted by the pododerm covering the plantar cushion or fatty frog, and presenting almost the same form as the latter, lies as a soft and very elastic wedge between the bars and between the edges of the sole just in front of the bars. A broad and shallow depression in its center divides it into two branches, which diverge as they pass backward into the horny bulbs of the heel. In front of the middle cleft the two branches unite to form the body of the frog, which ends in the point of the frog. The bar of a bar shoe should rest on the branches of the frog. In un-shod hoofs, the bearing edge of the wall the sole, frog, and bars are all on a level, that is, the under surface of the foot is perfectly flat, and each of these structures assists in bearing the body weight.

(To be continued.)

How a Rubber Tire Setter is Operated.

BILLY BUNTZ.

Although many smiths are using setters for *steel* tires, yet not many smiths know much about *rubber* tire setters, notwithstanding that rubber tire work is profitable on account of there being so many rubber-tired vehicles.

Although a rubber tire setter is a simple machine, some instruction is necessary where the smith is uninitiated in applying rubber tires. There is a deal more in a good rubber tire setter than a mere clamp, i. e. to render good service the setter must be of absolutely

Fig. 4. COMPLETING THE SCARFING.

perfect adjustment; therefore, in explaining the operation of a machine of this kind it is necessary to describe some setter in particular. The one here explained is that of the Goodyear Co. of Akron, Ohio.

This machine may be set up perpendicularly, as shown in Fig. 1, or horizontally, although the position here shown is generally used, the machine being attached firmly to a substantial post at a convenient height for the man operating it. The bracket Q, Fig. 1, supports the wheel. Take a piece of rubber of proper length, lay it full length on floor and insert wires, which should be at least a foot longer than the rubber. Manufacturers furnish schedules giving proper sizes of wire and rubber when a machine is ordered.

About six inches back from one end of the wires attach firmly double clamp D 92, taking care that ends of wires are even and the thumb-screws in clamp very tight. Fasten ends thus clamped, firmly in right-hand tire machine jaw, with bottom of tire upward and the ends extending through the jaw about 1½ inches. Scarf the ends of the wires for about ¾ inch. Loosen jaws to re-

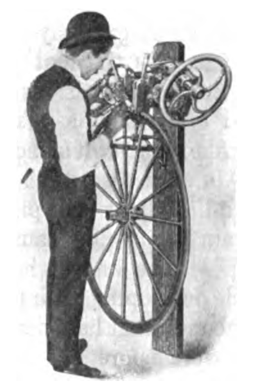


Fig. 5. BRAZING THE ENDS OF THE RETAINING WIRE TOGETHER.

lease wires, then turn tire right-side up and insert scarfed wires into grooves in right-hand jaw so that the ends are slightly past the middle of the space between the two jaws—*the filed or scarfed surface down.* Tighten jaws by first turning nut T moderately tight, then push upward right-hand lever W.

Fig. 2 shows the operation in drawing the tire up. Remove double clamp and force rubber firmly against outside of right-hand jaw. Pass rubber tire, with wire in it, around wheel, threading free ends of wire through grooves of left-hand jaw, then through opening in right-hand jaw, and after pulling out with hands as much wire as possible, see that the two ends extend exactly the same distance, and then fasten wires in winding drum or vise. To make sure that wires are firmly held, close temporarily left-hand jaw and draw wire to tension, then loosen left-hand jaw and draw up wires by turning hand-wheel P, thus drawing tire into channel.

Fig. 3 shows how the rubber is compressed. Draw rubber around wheel by hand from right to left, clamping it to the rim with rubber clamp at point Z, about 30 inches from left-hand jaw, which will leave a loop of rubber be-

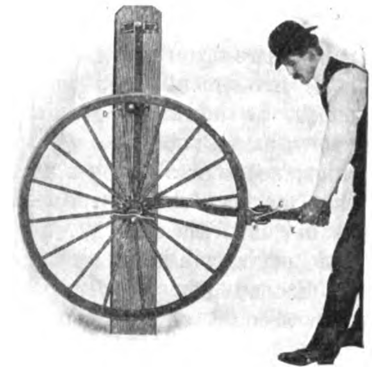


Fig. 6. JOINT CLOSING MACHINE.

tween left-hand jaw and rim clamp; that, when wires are pulled up, will contain all the extra rubber that is to fill space left between jaws. Paint channel with paste between clamp Z and left-hand jaw, also between jaws, to make tire slide easily when closing joint. Turn hand-wheel P until this loop is forced firmly into channel, drawing up very tight. Take care that rubber is not "buckled up" against outside of left-hand jaw.

Fig. 4 illustrates the completing of the scarfing. Tighten left-hand jaw same as the right and while wires between two jaws are held at tension, scarf them at a point exactly above the other two scarfed ends, filing the wires until they break, but do not cut wires before scarfing, this being an important admonition. By using a small hammer the wires may readily be brought into proper position with scarfed ends exactly lapping, when the wires are ready for brazing.

Fig. 5 shows a small handwheel which may be used to increase or decrease the tension and to assist in making ends fit perfectly. Place a small piece of asbestos under the wires and apply brazing torch. When wires are red hot apply compound and spelter. Put no strain on joint until cold; when nearly cold it may be cooled off by applying strong soap-suds with a brush, and the braze tested by a little pressure on left-hand handwheel. Loosen both jaws by dropping levers, and turning nuts, Fig. 4.

Fig. 6 shows joint closing machine. Before closing joint, clean or trim ends of rubber and apply rubber cement. D is a rubber-coated clamp for holding the wheel, E the lever, F the clamp,

which slides over the rubber, i. e. does not pull it. When tire has been brought together the lever E will have been worked to where the opening of the tire ends, as positioned in illustration and the joint held firmly by G being slid down to F.

A rubber tire setter is a profitable investment for any smith, as nowadays every town has its rubber-tired rigs; not that alone —it is a matter of but a year or two until the majority of buggies will have rubber instead of steel tires, on account of the easy-riding quality of a rubber tire vehicle.

An Engine Repair.

W. W. HERRING.

I would like to warn those that have gasoline engines against letting them freeze. The water in the jacket of my engine froze, bursting the cylinder casting. I ordered a new one, but it would not fit, so that I had to either wait for another or fix my broken one. I went to work and cleaned the cylinder well, filed the break bright and soldered it. The engine is now working as well as it ever did. I suppose it would have been better to braze it, but I did not have any means of doing that.

The Practical Scientific Treatment of Interfering Horses.—3.

Interfering. Fetlock Striking.

E. W. PERRIN.

Fetlock striking in front, commonly called ankle hitting, is the most common of all interfering. It consists in the animal striking the inside of the fetlock joint with the inside of the opposite foot. Sometimes both ankles are affected, but more frequently only one. Sometimes the injury is so severe as to cause the animal to fall as a result of the blow. Some neglected cases cause chronic enlargements and serious complications of the joint.

CAUSES: There may be one or more causes all operating together to produce this result, but invariably the prime factor of them all is defective conformation of the limbs. It is common to find some young horses interfering when first broken in to work, or upon starting to work again, after a long spell of idleness in a sale stable or in the pasture. But in these cases the animal interferes because he is not in working condition, and I need hardly say that no system of shoeing will remedy the trouble in such cases. Reason suggests the protection of the injured parts with properly fitting boots until the animal is in working condition. Again, an animal may interfere as a result of pain in the foot or limb. For instance, on two occasions I have been accused of causing a customer's horse to interfere, as a result of indifferent shoeing, and in each case, upon investigation, I found the horse had picked up a nail, the pain from which caused him to interfere. I have known horses to interfere while developing splints, ringbones or sidebones, that had never been known to interfere before, but as soon as these horses recovered from the lameness, they ceased to interfere.

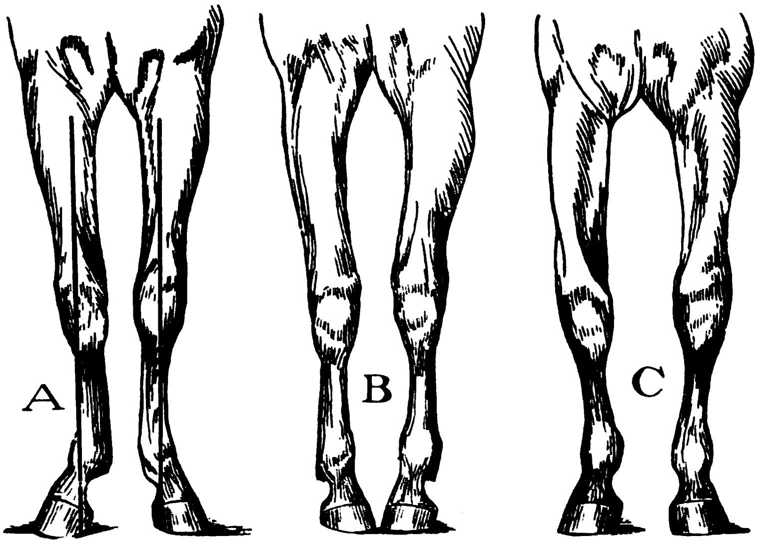


Fig. 7. POSITIONS OF HORSES THAT INTERFERE.

It is easy to understand how pain in a person's foot, ankle or knee might so interfere with regular locomotion as to cause him to hit his ankles together. Again some horses interfere as a result of being overworked; but the horse with a perfectly sound, well-formed set of limbs does not interfere, only when out of condition, from sickness, or some other cause.

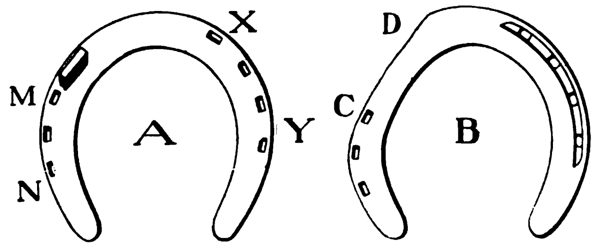


Fig. 8. TWO GOOD SHOES FOR HORSES THAT INTERFERE.

As to defective conformation of the limbs, the form of all others is the toe-wide position with twisted cannon bones. The explanation of this lies in the fact that the twisted limb forms a mechanical impediment. The knee, being a true hinge joint, it will readily be seen that if the horse's knees are set square to the chest, when the front foot is raised, it will point to the hind one on the same side. If the front leg is set at an angle to the chest, as is the case with the toe-wide horse, (A, Fig. 7) then when the foot is raised it points more or less across the body, to the opposite hind leg. Hence it is very difficult for it to extend in action, without striking the opposite leg. To illustrate this, take an ordinary large strap hinge, hold it open square to, and behind the horse's knee, now bend the hinge and you see it points straight back to the hind leg on the same side. But if you hold the hinge at a slight angle to the right or left, then when the hinge is bent it will point under and across the body or outside of the body. So when the legs are twisted outwards—toe-wide—the feet raise up under the body. When the legs are twisted inward—pigeon-toed—(B, Fig. 7) the feet raise outside the body. Have a toe-wide horse trotted toward you and you will see the front feet describe a semi-circle to the inside, while on the other hand the pigeon-toed horse describes a semi-circle to the outside. If you sit immediately behind a pigeon-toed horse in driving you can see the bottom of the fore foot at every step by glancing over the horse's shoulder, but you cannot see the bottom of the foot in the toe-wide horse, unless you sit to one side, because the "pick-up" is under the body. It is this mechanical impediment which makes it so hard to prevent interfering in the toe-wide horse.

The calf-kneed horse, (see A, Fig. 5, January issue) may strike the ankle, but if he has high action he will hit the knee on account of the knee being so close to the passing foot. It will be observed that the knees of this horse are about three inches out of plumb, thus leaving that much less room for the foot to pass. Added to this, the legs from the knee down incline outward—toe-wide—in which case the feet will describe a semi-circle to the inside, hence the interfering. Fig. 7, C, shows a bow-legged and buck-kneed horse. This particular horse is an ankle hitter. It will be observed that his legs are wide apart, but they are

not set on square to the shoulder. They are twisted slightly outwards, hence they move to the inside, striking the opposite ankle.

The remedy consists in preparing the hoofs in conformity with the limb, and the application of suitable shoes. For the toe-wide horse, leave the hoof slightly high on the inside, and roll the outside quarter. Use shoe shown at A, Fig. 8, and bend the shoe up at the outside quarter, from X to Y. Fit close between M and N, the point of contact. But fit full at the outside toe where the slug is welded on.

For the calf-kneed horse, (A, Fig. 5, January issue) the hoofs should be lower on the inside than on the outside. The inside toe is the point of contact in this case. Use shoe shown at B, Fig. 8, fitted close between C and D, at which point a little of the hoof may be rasped away. For the buck-kneed horse the hoofs will naturally be high at the heels. If, however, the hoofs have been rasped too low at the heels, then shoe with heels with weight on the outside quarter of the shoe and roll the shoe where the wear is greatest. In this illustration, (C, Fig. 7) the wear will be at the outside quarter, but in some cases it will be at the outside toe or even at the toe.

It may seem strange to say that in some cases it is necessary to leave one foot high on the inside while its fellow is high on the outside, yet this is true, for some horses have one leg calf-kneed with its fellow toe-wide and twisted outwards. I found this out many years ago through the lessons of practical experience. A chronic interferer lost a shoe while on a long journey, and when he got back to town he was lame from soreness. I observed that the hoof was very low on the inside. As it was impossible to level it on account of its being worn so low, I fitted the shoe to the hoof with the inside low, and to my surprise the horse ceased to interfere. Hence I discovered that in this case, which I had thought incurable, the horse travelled perfectly clear with one foot high on the outside, and its fellow high on the inside.

Do not infer from the above paragraph that it is wise and the idea to be encouraged, that of experimenting with horses' hoofs. Where you have a perplexing case, study it well and shoe the horse to the best of your judgment. Wherever possible, follow up such cases.

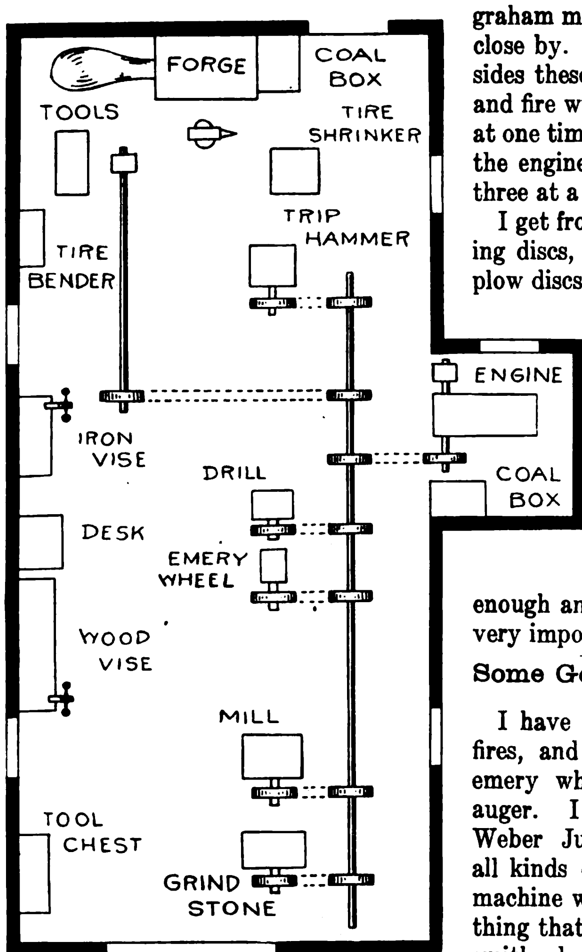
Sometimes a corn, even though it does not cause lameness, may cause a horse to interfere. Do not shoe heavier than is necessary for a month's wear, except when you need weight to balance the action. Above all, the study of causes is the most important point, as each case has some peculiarity of its own.

(To be continued.)

Improvements in a Blacksmith Shop.

A. BRUTON.

I have been enlarging my shop and putting in some new machinery since last writing. Recently I installed a Weber Junior 2½-horse power engine, and an emery wheel. I think the Weber engine is the one for the blacksmith. I also put in a trip hammer, making the same myself, at a cost of $30.00, counting time and expenses, and it is worth as much as a high-priced hammer for plow work and other work calling for knife steel and light forgings on other iron and steel. I can sharpen two or three lays with it where I could only sharpen one the old way and do it better and smoother. If any brother smith would like my plan for making a trip hammer I will gladly send it on request.



PLAN OF SHOP OF A. BRUTON, HILL CITY, KANSAS.

I have also installed a Friction Rotary Disc Holder, to hold discs on emery wheel, while it runs, the disc revolving and keeping from heating. It can grind any bevel desired and any size disc. I bought mine from the Novelty Manufacturing Company, of Council Bluffs, Iowa, at a cost of five dollars, and would advise every blacksmith to get one as it will pay for itself in one day's work. I have already ground fifteen dollars' worth of discs and would not take twenty-five dollars for it. It will grind a disc while the smith does something else.

I also am running a small feed mill in connection with my shop work. It grinds from 4½ to 12 bushels per hour, according to the grain and how ground. I have a great deal of table meal and graham meal to grind as there is no mill close by. I also have chop feed. Besides these, I run my drill, grindstone and fire with my engine. Of course not at one time, as it would be too much for the engine, but am able to run two or three at a time.

I get from 25 cents to $1.00 for grinding discs, from 12-inch up to the large plow discs. I have given up horseshoeing altogether, as I had so much other work, prefering this to shoeing. I gave this part of my work to a man who makes a specialty of it.

I give herewith plan of my shop as it is now, 18 by 38 feet with engine room, 6 by 8 feet. It is plenty large enough and I have good light, which is very important.

Some Good Prices from Kansas.

W. S. HENNINGER.

I have a shop 24x50 feet, run two fires, and have a Boss Trip Hammer, emery wheel, power drill, and tenon auger. I run all of these with a 2½-Weber Junior gasoline engine, and do all kinds of plow work, carriage and machine work, horseshoeing and everything that is done in a general blacksmith shop. Jewell City is a town of about 900 inhabitants and has three blacksmith shops. We agree on prices and therefore get pretty fair compensation for our work.

Four new shoes	$1.50
Four old shoes	1.00
Sharpening plows	.25
Pointing plows	.75
Sharpening cultivator shovels, per set	.50
Grinding cultivator shovels	.75
Pointing cultivator shovels	.50
Setting tires, per set	2.00
Single felloes	.25
Single spokes	.20

I think THE AMERICAN BLACKSMITH indespensable to every up-to-date blacksmith. Also, I believe your effort to have better laws placed on the statute books of each State for collecting blacksmiths' bills is a good one.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

How to Point Plows.—Will some brother smith give the latest and best plan for pointing old plows? A READER.

Gasoline Engines.—Will some brother smith tell me which is the best gasoline engine to buy? WM. E. GIDDINGS.

For Brother Smiths.—Will some one of the craft tell me how to make a pair of dividers or compasses; also a pole axe? It would help me much. T. H. LONG.

In Appreciation.—During the past thirty years I have done my best to become a good horseshoer. I regard THE AMERICAN BLACKSMITH as indispensable. GEO. FRASK.

Mixing Paints.—Will some of the readers of THE AMERICAN BLACKSMITH tell me how to mix paint so as to obtain different colors, especially a good wine color? A READER.

A Hint on Lead Hardening.—Answering the question of J. F. in the December issue, as to hardening in lead, he should oil the steel before dipping, and it will come out nice and clean. E. B. F.

Tempering a Gaff.—I would like some of the readers of THE AMERICAN BLACKSMITH to tell me the best way of tempering a gaff used in fighting game cocks. WALTER D. WHITE.

Gun Springs.—I should like to learn from some of my brother gun doctors a recipe for tempering gun springs by simply heating to a cherry red and then dropping in a solution of some kind, without drawing any temper. J. SUMMS.

Book on Steam Engine.—Can some brother craftsman direct me to a book of instructions on upright steam engines of the Buckeye or other make? I have one I wish to repair, and would like some instructions as to how to do it. JOSEPH MILSTEAD.

Questions for Smiths.—I would like to hear from brother smiths what power hammer they consider best for small shops. Also, what shoeing stocks is the best. I would like to hear from some one who has tried the Barcus stocks. W. W. HERRING.

A Horse That Wings?—Will some brother horseshoer tell me how to shoe a horse that wings with one foot? I have such a horse and have tried everything I can think of, but still he will wing with his right foot eight or ten inches. J. E. DAVIS.

Who Can Say.—I would like to inquire of brother blacksmiths who have had experience, whether it pays to put in a power hammer or not. I have a gas engine and am thinking over the hammer question. Who has found that it pays, and on what kind of work? AN INDIANA SMITH.

Success in Business.—L. H. Morgan, Defoe, Ky., reports an excellent fall and winter trade in his section, which he attributes greatly to promptness in filling orders. He desires to know the best way to put on steel toe calks, and also what brother craftsmen consider the best welding compound.

Boring Steam Cylinder.—I would like to have the following information through these columns,—how to bore a steam cylinder in a lathe, illustrated with cuts and diagrams, showing the proper tool to use in bar. Who can give me the information I desire? J. H. MASTEN.

Highland Park College.—Des Moines, Iowa, has recently added to its engineering shops a number of new forges and a large blower, purchased of the Buffalo Forge Company. This increase was found to be necessary to meet the growing popularity of the institution.

The Address of Mr. F. L. Morgan, over whose name an item appeared in our December issue, is Gladstone, Illinois. Such a large number of letters have come to us asking for his address that it is given here for the benefit of those who may wish to write to Mr. Morgan. [THE EDITOR.]

Shop Power.—In my opinion steam is cheaper than oil for power. If a person doesn't need much power, he can get a larger boiler, say double his engine's capacity, and it will steam much better, take less fuel, and require less attention. I prefer steam to gasoline. W.W.HERRING.

Spokes.—In reply to Mr. A. J. Rooks, I should say the spokes did not come through the felloe far enough or were not sound timber next to the tire. Never gauge the end of a tenon next to the tire. Leave it flush with the outside of felloe and the spoke will not sink in the inside of the felloe. D. A. DICKSON.

About Wheels.—I would like to have some men who have had good, long experience, tell me which is the best kind of wheel for ordinary wagons, everything considered, the Sarven flanged hub wheel or the wood hub wheel with staggered spokes. Why is one better than the other? NO NOTHING.

A Tire Query.—I would like to have some readers of THE AMERICAN BLACKSMITH give me some help on tire setting. What is the best way for telling just how much draw to give when re-setting a tire? I do not get as good results in tire work as I ought to. How do you find just what dish to give a wheel, and how big to make the tire? JOHN G.

From Oregon.—I am in favor of a Lien Law for blacksmiths, heartily so. I also favor forcing blacksmiths to stand examinations to prove their qualifications before allowing them to practice the trade. As to shoeing, I agree with Mr E. W. Perrin and Mr. A. M. Meisner. It is against common sense to think that all interfering horses can be shod alike. W. A. P.

Grinding Oyster Knives.—I am interested in grinding and polishing, and want some information as to what I need to grind oyster knives, and polish the same without drawing the temper. An oyster knife is about five inches long, sharp on both edges about two-thirds its length. and about $\frac{1}{4}$-inch wide at the small end and $\frac{3}{8}$-inch at the large end. CHAS. D. BRIDDELL.

Some Texas Prices.—In our State we seem to have an unusual number of poor workmen, who keep prices down. In my town, however, we get pretty good prices, as follows: Shoeing, $1 to $1.50; welding shaft irons, .35; poles, .35; wood axles, $3; tongues, $2.50; buggy shafts, $1.25; reaches, $1; spokes, .20; setting tires, $2 to $3; sharpening plows, .10 to .25. J. HANSON.

Pitch and Gather of Wooden Axles.—In answer to Mr. J. N. McDonald would say that in order to give wood axles the proper gather and pitch, draw a straight line through the center of the axle at each end. For the pitch I give $\frac{3}{8}$-inch below the line and for the gather I give $\frac{1}{4}$-inch in front of the line. Take the compass and draw a circle the size of the point of the axle, and work to that. J. M. MILES.

A Special Request.—I know that some readers of THE AMERICAN BLACKSMITH can tell me what I want to know. First, I would like a description and illustration of the best kind of ice-grips or ice-tongs for lifting ice from a river. Second, I would like the best and simplest plan of making an iron boot to raise a lame boy about three inches. Can anyone send in to THE AMERICAN BLACKSMITH description and drawing of either of these? J. F. SEMPLE.

Recutting Horse Rasps.—In answer to J. H. Bartholomew in the January number in regard to recutting horse rasps my method is to draw the temper in a wood fire. Recut the rasp with three-cornered file the same as you would file a handsaw. Heat red hot and then plunge in brine. Put on a little oil and brush the rasp with a coarse brush. I use Heller Bros.' tanged rasps, and they stand the wear excellently. L. E. BALLON.

How to Pull Wagon Spokes.—I have seen so many ways of pulling spokes from hubs, that I will now give my way, which I think is much simpler than any I have seen. Put the wheel on wheel-jack and screw it down solid. Take two or three pound hammer and give a few sharp blows on the top of the spoke about two or three inches from the hub. This will loosen it so that it can be easily pulled out. Do not strike too hard or the spoke will break next to hub. T. E. LARSON.

A Difference of Opinion.—I was very much interested in the articles in the December number by A. M. Meisner and E. W. Perrin. Mr. A. M. Meisner gives six rules on horseshoeing, five of which I think are good. The one with which I disagree is the fifth, namely, "beware of opening the heels." I believe in most cases the heels should be opened and kept open. I would like to hear his reasons for not opening heels and also Mr. Perrin's opinion on the matter. DONALD M. FRASER.

A Michigan Shop.—I have a nice shop with basement, but do not do any horseshoeing. I have all the blacksmithing and wood work I can do, having been in the business for twenty-five years. My shop is equipped with a six horse-power gasoline engine, with rip saw and buzz planer, together with other machinery, all up to date. As yet, I have no power hammer, but expect to buy one this coming summer, to use especially for welding tires, as I build about twenty or more new wagons a year. F. L. HILTON.

One of Many.—Enclosed please find money order for one dollar for my renewal subscription to THE AMERICAN BLACKSMITH, which I can say I would not do without for $5 a year if I could not get it for less. I have received a great deal of information out of your valuable paper which I had never heard of and would not have heard if it had not been for your paper. I am heartily in favor of higher prices for our labor, and will do all I can to help raise the prices equal to that of skilled labor. G. H. NOWNER.

Prices in Iowa.—I noticed in the December paper that our brother smiths in Canada have raised the prices of shoeing, so I will give them a few prices, as we have also raised the prices in this part of the State: New shoes, $.45 each, per span, $3.60; re-setting old shoes, $.30 each, per span, $2.40; Neverslip shoes, $.75 each, per span, $5.00; bar shoes, each $.75; half bar

shoes, each $.50; hand-made shoes, each $.75. We think the horseshoer should have good pay for his work. E. C. LEWIS.

An Inquiry.—Noting in the January AMERICAN BLACKSMITH an axle shaping block and a tool for measuring axles, I would like to have the smith who wrote the article, or some one who has had experience in that line of work to give me the dimensions of the two devices as I have a great deal of arched axle work. I would like to hear from some one who has used the Freeport Power Hammer, as I would like to know what they will do and whether they will help a man in place of a striker.

G. P. BLANCHARD.

Request for Advice.—I live in a little country place about four miles from any kind of a town. I have worked in the same shop for five years, having learned my trade here under a party who had a good business, horseshoeing and wagon repairing, horses being brought to him for miles around, as he was an expert. (We have no plow work here at all.)

At last a change took place. He went to his brother smiths and asked them to put up the price, which they did. But soon one of them cut it down again and my boss lost a lot of his trade, so that he, too, cut the price. Though he got most of it back again, he could not make a good living, so he sold out to me. I put the price up, but my business has been poor ever since. I wish some brother would advise me what to do in such a case, whether to cut down the price or give up the shop J. J. MULLEN.

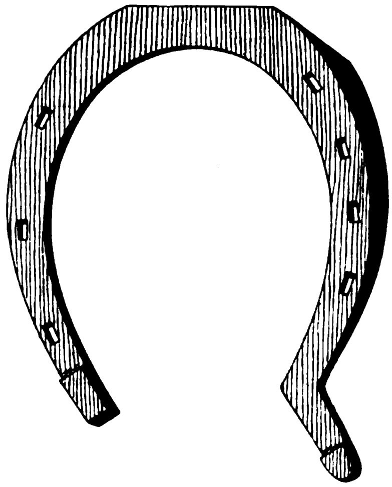
Against a Cash Basis.—I notice that Brother A. C. Green thinks cash dealings, if adoted by the craft, would be of greater benefit than any Lien Law. I cannot agree with him. In the first place, there are many customers who cannot raise cash for every little job they have done, and these men would have to go to the implement man and get a new piece. Here he can get credit for six months. We have lots of customers who would let their horses go bare-footed if they had to pay cash. They are all good pay, but have money only about once a year. Hence, on a cash basis, many a job would go undone. Therefore, I say that this Lien Law is just what we want. It is something which will bring our customers around when they have the money, and that is all we need. I have two men working for me and we have all we we can do. Everything is all right, except one thing, and that is, we need a Lien Law to insure us our pay for every job we do. I wish the craft to consider me in the swim from start to finish on the Lien Law proposition. L. V. COULTER.

Treating a Stifled Horse.—A customer of mine has a horse which has a weak stifle. What is there which can be done to help it? T. H. BRIGGS.

In Reply—A stifle is usually due to a displacement of the knee-cap. Very often a sudden jerk will be all that is necessary to spring the knee-cap back into place. In case of a weak stifle, the trouble may be often overcome by drawing the leg which is affected well forward by means of a rope attached to the lower end, and then grasping the knee cap with the hand and forcibly pushing it forward and inward until the bone suddenly slips into position. The unusual stiffness of the legs should suddenly cease with a spasmodic jerk and the horse should be able to walk or trot without lameness. Although this may end the trouble for a time a repetition of it may subsequently take place and eventually lead to a habitual weakness. To correct this tendency, warm poultices and douches of cold water will often help, and liberty in a box stall or in the field is also beneficial. The use of a high heel shoe is often recommended. The part may be strengthened and toned up by the use of stimulating liniment, friction or even by blisters.

Gather of Axles.—I notice from the January issue that I have won one of the prizes on wagon work, which I much appreciate. I also congratulate Mr. Nels. Peterson on winning the top prize. I have read his article so far with much interest, although I must criticise him on one point, and yet partly agree with him at the same time. He states that the factory has omitted the gather on axles, from the fact that it causes the wheels to run in and the taxing to bind at the shoulder axle, thus causing friction. That is right to a certain extent, while the job is new and is a perfect fit. But later on the axles become worn and loose in the boxings. As the vehicle moves forward the pressure is directly in front of the spindle, and the wheels drop back and adjust themselves to the spindle. Now, in this position the wheels are wider in front than in the rear. This will cause the wheels to run out, and you have the same friction with the nut as you had with the shoulder of the spindle. A wagon of any kind is used much more after it is worn than before. I think a wagon of any description will run easier without any gather while new, but not after it has been worn. Please explain. M. A. FOSTER.

Reply to Interfering Query.—In answer to D. W. Cryce in the October number of THE AMERICAN BLACKSMITH on



A GOOD SHOE FOR PACERS THAT CROSS FIRE.

how to shoe horses that interfere, I would say from my experience with that kind of shoeing the best way is to shoe with inside toe and heel calk and no calk on the outside. Have inside of the foot as high as practicable. For pacers that crossfire, we use what we call a crossfiring shoe like the accompanying drawing.

J. M. MILES.

Repairing Rubber Tires.—I will answer Frank Teuber's question about repairing rubber tires. I use a Sweet machine and it works all right. Campbell Iron Company, of St. Louis, Mo., sells them for $18.00, full instructions with illustrations going with each. However I will give you a few points which troubled me somewhat. I broke the wire at first. This was caused by drawing up the wires too tight before fastening them in the machine. They should be fastened so that they will wrap nearly around the sleeve before the wires are too tight. This will take the bearing off the sharp corner and keep them from breaking. Be careful to follow instructions closely. Cut your rubbers five or six inches longer than the distance around the wheel so that the joints will not pull apart. To scraf wires, file your first wire so that the ends will pass each other ⅜ of an inch. Then scarf with a three-cornered file eight or ten inches long, fit the ends of this wire nicely, push it down in channel so that you can get to other wire, cut your next wire and scarf the same as the first one. Fit each wire separately, and be careful not to let the brass run from one to the other of the wires. If you do, you will have trouble in pulling up your rubber. You will find full instructions for brazing with your torch. W. A. SHORT.

Remedy for Low Prices.—To my mind the plan which would be ahead of any other for the benefit of the craft, is to get a law enacted to compel every wheelwright and blacksmith to stand an examination relating to his trade.

On passing such examination he will receive a diploma, which will show him to be in possession of such knowledge that he may open a shop. This would keep out all unskilled men, which is the class that usually cut prices. The skillful workman who knows the cost of material and knows what his labor is worth is not so apt to cut prices as the poor workman. Skillful workmen that have spent their time and money to learn the trade should have some protection against those who have merely picked up the trade and don't know enough about it to earn good wages.

The craft, as a rule, is slaving for just a scant living. My experience has been, that in the last 12 years all timber that goes to make up a vehicle of any description has steadily increased in price, with no chance for it to ever be any cheaper owing to the scarcity of wagon timber.

During this time and much longer, the prices of work have decreased. No one can dispute this. As the prices of material advance our labor should advance in proportion. But it has been the reverse. If every workman was compelled to pass an examination just as when he enters the civil service, then we would not have to contend with the lower class of workmen.

M. A. FOSTER.

Something More With Regard to the Farmer.—I noticed in the December number the article, by a farmer, from the Farmer's Sun. It is my opinion human nature is the same in Illinois as in Canada. He says 20 cents will pay for the shoes and five cents for coal and nails and all the rest is net profit for the blacksmith's few minutes' work. As your fire insurance agent will tell you, property decreases in value at the rate of about 2% a year. Taking my own property for an example, which is rated at $1,200, a decrease of 2% would mean $24.00 per year. Then again the roof repairing averages about $15.00 per year. Investment in tools and shops is about $150. I have about four hundred dollars' worth of tools, and having run a shop for twenty-one years, in that time I have worn out two bellows and one blower, two sets of taps and dies, and the third set almost worn, one drill and the second nearly so, a ninety-dollar sewing machine and a box-setting machine, a tire shrinker, a shear, a vise and innumerable other tools. These together with lights, coal, taxes and a helper amount to about $800 a year. Now our farmer friend never thought of these expenses. Not only the above do we have to number among expenses, but also bad material and bad accounts. Now, when prices of stock and living expenses are so high, I feel sorry for the smith who charges but 10 to 20 cents for re-setting old shoes and 80 cents to $1 for new shoes. My advice is to charge a good fair price for your work and give them a good fair return. You will always have plenty of work. Let the kickers go. S. B. BRYANT.

Cash vs. Lien Laws.—In regard to the Lien Law vs. cash basis, I think if such a thing as credit was not known to the world, we all would get along better. The cash basis would be very nice, but it would be very hard to get the smiths to stay with the idea of no pay, no work. If a man breaks his wagon down and hasn't got the price to have it repaired and you know he is perfectly honest, it is hard to deny him. How many men in a community do you find, that if they were compelled to put up the cash for all their work, would not limit the amount of work done? I think it a good plan to get the Lien Law, consolidate, and get the prices up to a good living point. Then give a small discount for cash, and after 60 days add on a per cent. This will have a tendency to make the customers a little more careful in letting their accounts run. The small discount would have a tendency to encourage the customer to pay cash and hence be a very good thing.

I don't think there is any class of people any more imposed on than the blacksmith or wheelwright, who pays out his hard-earned money for material, adds his labor, which at the present prices is only a little more than common day labor, and then has to wait the customers' convenience, regardless of bills coming due and other expenses which occur every day in the shop.

Materials used in the shops are steadily advancing in price also. I would like to hear from some brother smith or wheelwright on this subject. M. A. FOSTER.

Trade Journals—Horse Racks—Plow Work.—I do not think any up-to-date smith should be without a good trade journal—the expense of one is nothing compared with the good one can get out of them.

No one shoeing rule applies to more than one horse, because no two horses are exactly alike. Every man who has much shoeing to do ought to have a rack. I raise the horse so he can stand straight, and so that moving the foot in any direction, makes it clear the floor. I think it is a mistake to tie all of a horse's feet at once.

Some time ago I noticed an article on making plow lays, where the writer said to fit the short landside to the long one, bolt fast, fit the lay, bore the holes, bolt on the lay, then take landside, lay and braces off together and weld up. I can see no real need of taking it to pieces after it is once bolted together. The handles and beam would be but very little more in the way than the landside and braces, not to consider the trouble of putting them together again.

My way of making a lay is first to fit the landside and clamp on, and then the lay and clamp it. Begin welding at the heel. Take heat enough to stick well. Knock clamp off, take a good heat and weld the heel solid. Put it on the plow, seeing that it fits. My neighbor smith makes them the same way I do, with the exception that he commences to weld at the point. I once worked for a smith who put the landside and lay in the fire separately, having the helper take the landside out while he took the lay, and welded as you would an ordinary piece of iron. B. E. ROBINSON.

Hoof Contraction.—I wish to call attention to the fact that much harm is done to the craft by giving wrong instruction in shoeing and other pathological matters. Especially is this so in the case of contraction.

Contraction develops in phases or stages, and may be more or less serious, although I consider it easier to cure than any other trouble of the hoof. Contraction is nothing more nor less than a partial or entire interruption to the peculiar spring-like opening and shutting process of the hind or rear center of the hoof shell. This portion of the foot is naturally adapted to make the necessary protection for the enclosed foot and its blood circulation.

Chronic contraction is the worst, as it produces counter-pressure upon the inflamed foot. It really means a dead hoof on a live horse, which is about the worst torture a horse may have to suffer. This should not be carelessly neglected. By the proper use of a good pair of heel expanders, contraction may be removed in a few days. I do not use poultices, water-soaking or ointments of any kind. By the simple use of expanders the moisture and elasticity of the hoof will return in a few weeks.

In case of high fevers, poultices may be used, either hot or cold, according to conditions.

It is true that artificial moisture brings relief to contractions for a term of say three or four weeks, or perhaps for as many months. But it means only temporary relief at best. K. C. MOSER.

How to Treat Corns.—Regarding Mr. J. S. Jennings' query concerning corns in the December issue, the following remarks may be of use: Corns are caused by under pressure of the shoe upon the inner heel, or at the angle between the bar and the crust. They are especially likely to occur when the wall breaks down or is cut away, so that the shoe rests upon the sole, or if the shoe should be nailed too far back on the outside and toe. In this latter case, if the shoe is left on too long, it will be drawn outward and forward, so that the inner heel will be drawn under the quarter and rest upon it, causing a bruise. The effused blood then mixes with the horny matter and forms a red spot. When the irritation is continued, so as to produce very much inflammation the place may ulcerate, even affecting the inner wing of the coffin bone discharging at the coronet. Should the quarter become very much contracted, the space between it and the bar being greatly lessened, there is great bruising and pressure upon the soft parts, exciting inflammation and causing a corn. Generally the horseshoer cuts away the parts so that the shoe does not rest upon them, and puts on a little caustic, or touches it with a hot iron, destroying the sensibility. He puts on a bar shoe so as to remove all pressure from the part. This relieves the horse for a time, but should the shoe be left on a little too long, or press upon the parts in the least, or should gravel or dirt settle between the shoe and the corn, the horse will go lame. This treatment seems to answer for a while, but soon the horse will be worse than ever. A far better way is to fit an ordinary shoe to the afflicted foot, mark on it with a pencil the position of the corn, and then remove that part of the shoe, cutting out the piece that would press upon the corn. The corn will gradually disappear and the horse may be shod with an ordinary shoe. This method allows the animal to be used steadily during the cure. E. M.

A Hardening Problem.—I have a question as follows, which I would like to have answered. I use a lead pot in which to harden a piece of four-inch gas pipe, plugged at one end and lay it on the fire at angles of about 45 degrees. When work is dipped in bath it seems to have a thick skin on the outside and will not harden. It is not the steel, as the same piece will harden in the open fire all right. J. F.

In reply, it is rather difficult to answer the question intelligently, for in stating his case he says, "that when the work is dipped in the bath it seems to have a thin skin on the outside and will not harden." It is not clear to me whether he means that the thin shell is the depth of hardness or softness. It is rather unusual for a piece of steel to have a thin shell on it and will not harden. If this is the case and it hardens perfectly in the open fire it must be due to the impurities in the lead which form a thin coating of oxide on the surface, thus preventing hardening. This can be remedied by selecting a lead free from impurities. I believe his trouble is with shell hardening, and is due to the lead being heated too hot, thereby applying the heat faster than the steel will properly conduct it. If a piece of steel is heated too rapidly the transformation will complete itself only on the surface; furthermore to harden a piece of steel perfectly time must be allowed for the cement carbon to be transformed into the hardening carbon throughout the whole mass before the desired results can be attained.

It is the practice in some places to use two lead pots; in the first pot the lead is kept at a lower temperature than the hardening heat, the tools are preheated in this, then transferred to the second pot where the lead is kept at the proper temperature to give the necessary hardness. This will give the required time for the chemical change to complete itself throughout the whole mass. Besides, the temperature of the lead in this second pot can be kept almost constant, which is impossible if the steel is cold when submerged in it. H. W. RUSHMER.

Spring Welding.—I thought I would give my way of welding springs, because I have not seen it described in THE AMERICAN BLACKSMITH since I have been taking it. I prize the paper very much; there is not a copy but I get something from it of benefit to me.

Now, about welding springs; I think at least three-fourths of the springs that come to my shop for welding are broken where there is a hole through them. I mention this because I know that some object to using a rivet to hold the pieces together while welding. I use a rivet every time, getting my pieces ready for the rivet in this way: I take the pieces of spring, heat the ends and cut off enough of the end to take all the hole off. Now I heat the end of piece for about three inches, take it from fire and dip end in slack tub to cool it some, so that it will not upset right at the end, as I want the upset about one and one-half inches from the end. Be careful not to cool too much or too long as it would break in upsetting. Now, having upset it sufficiently, I heat again if necessary and scarf it by drawing down a long scarf, wedge shaped, and then I punch a hole about one-half inch from the end. Having made ready the pieces in this way, I next take a piece of steel the same size as the spring and measure one and one-quarter inches, or about that, and mark. I scarf the end but the scarf is shorter than on ends of spring. Now I cut off at mark, scarf other end, and punch a hole in center of piece. I am ready now for the rivet, which is a piece of one-quarter inch iron. I do not use regular rivets, as the head will spread out and leave too much iron on spring. I put the ends of spring together, and if the leaf I am mending is from the bottom or lower half of spring, I put a short piece which I have prepared on top of the leaf, but if it is from top half I put a short piece on bottom. In welding a break where there is no hole at the broken place, I use a rivet made of old fork tine or other steel. What I claim for the above method is this: It gives a piece of solid new steel at the weakest point, *i. e.* the hole. It also gives material enough to leave the place mended a trifle larger than before broken, and as for the rivet it is right where I want to drill the hole, so that it is taken out with the drill. H. C. BURK.

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The Pulse of the Craft.

The extensive correspondence of THE AMERICAN BLACKSMITH with the craft in all sections of the country places us in a position to judge with considerable accuracy the sentiments of its individual members. There seems to be little doubt that blacksmiths are everywhere awakening to the need of taking steps to advance their welfare and improve their condition. Let the sentiment grow. There are few classes of mechanics who are as poorly paid today in proportion to their skill and labor.

Advice on Minor Diseases of Horses.

In a great many cases readers of THE AMERICAN BLACKSMITH wish advice upon the treatment of various minor diseases of horses. It is our desire to encourage questions of this kind. We do not wish, of course, to take the place of a veterinarian in any sense, for it is both undesirable and impossible to try to fill the position of a trained specialist on the spot. Nevertheless, there are many cases of minor ailments in which a veterinarian could not or would not be called, and in such as these much harm or suffering can be avoided propbyer advice. Here we have arranged that any questions sent us as to horse ills will be given careful attention and the best possible advice as to treatment, this, of course, without charge to the questioners. The greatest care should be taken to name the trouble carefully and state symptoms clearly.

That Gas Engine Article Contest.

In last month's paper was announced the offering of five prizes for the best articles on the advantage of gas engine power for smith shops. It has been decided to increase the number of prizes, because of the great interest which has been shown, so that a first prize of ten dollars, two second prizes of five dollars each, and three third prizes, yearly subscriptions to THE AMERICAN BLACKSMITH, are now offered. The articles should be limited to about 800 or a thousand words in length, and must be in Buffalo by April 1st. The subject is—Why does it pay blacksmiths to put in gas engine power?—though, of course, contestants may take the opposite stand if they desire. The articles will be judged upon the weight of the practical arguments advanced. We hope a great many smiths will take part.

The Handling of Horses.

The management of horses is a subject worthy of much study. Like children, horses can have their dispositions spoiled by improper treatment, for much depends upon how they are handled, or brought up, as it were. In the first place, a driver or other person in charge of an animal should always remember that he is dealing with an intelligence of a lower order than his own. He should never be unreasonable, and never guilty of losing his temper. The best results are obtained by coolness, quietness and kindness. The horse should, of course, be made to know who is master, but with gentleness as well as firmness. Horses which are well behaved are the result of kindness and careful handling, while others are too often made dangerous by unreasonable treatment, fear, fright and undue punishment. Thus it is seen how the value of a horse may be considerably affected by the handling he receives, especially in his younger years.

Nonsense About Metals.

In a recent issue of the Inventive Age appears an article dealing with what is termed "diseases of metals." It is pointed out that sharp changes of temperatures produce alterations of structure, and cases are cited where metal parts have crumbled away without apparent cause. Finally the statement is made that it appears to have been demonstrated that metals can be infected with disease, that they may be poisoned, and may suffer structural changes that lead to the question, are metals alive? It is to be regretted that publicity is given to views so absured upon their face. Of course, it does no harm to apply the terms of animal life changes to metals by analogy, but to attribute the properties of organic bodies, such as plants and animals, to inorganic metals, is more than misleading,—it borders on the sensational, which of all qualities should be absent from discussions of a scientific character. It is well known that metals under a large number of repeated stresses undergo a weakening or lowering of their tensile strength. This very aptly is termed fatigue, but would it not be equally illogical to bring this phenomenon forward as another indisputable proof that metals are alive?

Floating Blacksmith Shops.

Such is the multiplicity of machinery in a fleet of modern warships, to say nothing of the delicacy and fineness due in a large measure to a striving for minimum weights, that repairs are in order with much frequency. Rather than bring the ships to the repair shop, it has been found advisable often to send the shops to the ships, and so we hear of the equipment of repair ships, or floating workshops fully prepared to take care of all ordinary shipboard repairs. Such vessels have their machine shops with lathes, drills, shapers, punches, shears

and screw-cutting machines. Sometimes a small foundry is included. By no means of least importance is the blacksmith shop. A recent vessel of this type, built in England, has its smith shop equipped with forges, anvils, straightening blocks and a steam hammer. In spite of the immense horsepower represented in modern war vessels, however, it is safe to say that no shoeing will be done in such blacksmith shops.

Samples of Lamp and Balcony Iron Work.

The accompanying illustration shows a handsome design of wrought iron work as used in a small lookout balcony for a private residence in Detroit. The scroll work in combination with the vertical uprights gives a pleasing effect, and the size of the steel is in proportion to harmonize, without too clumsy an effect, as is often the case with many designs executed for this purpose. The floor is made of plain wrought iron bars, securely riveted to a wrought iron frame, the ornamental brackets bolted through the wall with nut and washer so as to make it absolutely secure for as many people as it will hold.

This work was manufactured by the J. E. Bolles Iron & Wire Works, Detroit, Mich. From their forge also came the wrought iron lamp of striking design, shown herewith. The effect is pleasing for its graceful strength.

Talks to the Jobbing Shop Painter.—12.

Advertising the Paint Shop.—The Paint Burning Lamp.—Carriage Tops and Top Dressings, Formulas, Etc.—Profits From Selling Paints and Varnishes.—Choice of Up-to-Date Colors.—Shop Conveniences. — Runways, Etc.

M. C. HILLICK.

Now is the time when the wise painter actively proceeds to carry out plans for a hustling spring and summer campaign. It is folly to wait until the rush of spring work is really on before completing arrangements by which it may be handled with the largest profit. In a former issue, painters, and possibly vehicle dealers and repairers who conduct a painting business in connection with their other enterprises, have been advised concerning the value of advertising. Publicity today is as necessary in conducting the painting business as is the public. And in the estimation of the writer, there is no form of advertising equal, in point of results obtained, to that afforded by the local or general newspaper. Advertising matter, if attractively written, is sure to reach the public eye in the newspaper as nowhere else. A brief, crisp card, right to the point, and changed weekly, is the most telling ad. for the vehicle painting business; and now is the accepted time to get such matter before the reading public.

The suitable advertising of one's business attended to, it is always in order to prepare tools and fixtures, and the shop itself, for the rush of work shortly due to make its appearance. A good burning lamp is an indespensable intensil in the paint shop, and for the small shop a lamp made of 18-gauge seamless brass, with a tank capacity of

EXAMPLE OF WROUGHT IRON WORK. ORNAMENTED LAMP.

one quart, and carrying a heavy burner, with a heating capacity of 2,000° F., is about right. Such a lamp should weigh not to exceed 4½ pounds, and preferably it should be made on the coil system, so as to retain heat to the maximum limit. The cost of such a lamp will be from $4 to $5.

Two or three broad, non-elastic glazing knives will be needed to use in connection with the lamp in the paint-burning work. These knives are to be used on the flat surfaces of carriage bodies. For running parts which have to be burned the small putty knife will be needed, or perhaps better still, a short piece of steel with a blade ¾ to 1 inch wide, and ground quite sharp on one edge, will be found desirable. It is not often now-a-days that the running parts of a carriage are burned off. It is worth from $3.50 to $5 to burn the paint from the running parts of a carriage complete, and most carriage owners prefer to put this amount where it will show more, relying upon the painter to build up a satisfactory foundation and finish over the old paint, which on the rounded surfaces of running parts he can do very successfully. The care and dressing of the carriage top, dash, storm apron, and other leather or rubber furnishings of the carriage, has grown to be an important item or part of the regular work of repainting. A good many painters elect to make their own top dressing, in which case it is advisable to prepare the dressing well in advance of actual needs. It always costs more to make such material during the busy season. A good formula for a dressing, adapted to use upon both rubber and leather, consists of ½-gallon liquid asphaltum; ½-gallon elastic finishing varnish; ¼-gallon each of boiled linseed oil, and coach japan; 2 pounds drop black. Thin the mass with turpentine, of which it will require about ½-gallon. Confine in an air-tight can and shake repeatedly to obtain a perfect assimilation of all the parts. Another formula of approved merit provides for the use of elastic finishing varnish, ½-gallon; ½-pound drop black; 2 oz. beeswax, the whole cut to a brushing consistency with turpentine. For an all-leather top upon which it is not desired to use the regular enamel dressings, darken out neatsfoot oil with drop black, and add a little melted beeswax to give the mixture a cooling property. Apply this with a soft piece of cloth and rub out thin and smooth.

While preparing dressings it is likewise a good time to prepare a place for the storage of tops, cushions and other furnishings of the carriage. Such a place should be as clean and secluded as possible. If a rack is made, the ordinary storage place for such parts of a carriage can be easily doubled in capacity. At an expense not to exceed $2, a rack may be built which will hold at least two tiers of tops with a section above this for cushions, dashes, fenders, carpets, etc. Make the rack of a size proportioned to the size of your shop, but in order to economize space, arrange to have two tiers. Locate such a rack, if possible, in a clean quarter of the shop, and enclose it with a common muslin curtain to afford greater cleanliness.

By advertising the fact, and arranging accordingly, the jobbing shop painter

may do a considerable trade in the sale of oils, turpentine, varnishes and special colors. Spring is the time when people make an effort to not only put their carriages, but their furniture and apartments in order, and if aware that they can obtain the necessary paint and varnish supplies of the local painter, they are, as a rule, prompt to patronize him. A considerable profit may be realized from this source during the next two or three months, at least, at a small outlay of labor.

It is always desirable, regardless of location or size of shop, to be strictly up to date in all matters of the paint shop, whether of shop practices or business methods. Study all the latest and most approved ways of doing work, and especially study to know the most fashionable colors for the season, as they apply to the various classes of vehicles. The catalogues of leading factory manufacturers of carriages will furnish one line of information relative to the most popular color combination. The color cards furnished by leading color and paint grinders will also materially assist in choosing and uniting desirable colors and color combinations. Other things being equal, the painter who produces the latest and handsomest color effects will get the best class of trade in the community, and the most of it. To follow on with the old colors and the old combinations will not suffice. The public —even the public of the rural districts— has grown more discriminating, and, generally speaking, it knows something of the most popular colors, as one sees them displayed on fashionable turnouts along city driveways.

It is a good plan to look the labor-saving devices of the shop sharply over, about this time and make necessary repairs and additions. It is an unwise policy to wait until the shop is in the turmoil of the busy season before making whatever additions or improvements in the shop or shop fixtures as are thought necessary. However small the paint shop may be, make it as handy as possible. It will pay, not only for the present, but for all time. The conveniently arranged and completely furnished paint shop is an excellent aid—or rather a chief aid—in meeting the ferocious competition which stalketh abroad in unoffending guise.

How about the shop runway—the outside runway—if it be supplied with one? Is it strong, and firm, and suitable? If undecided, now is the time to investigate. Not long ago a paint shop runway, with nothing in appearance to suggest a weakness, collapsed, and an expensive brougham went to the scrap heap as a result. And in addition to being strong, it should have a platform at the top sufficiently large to hold a couple of carriages at least. A good deal of work, both washing and rough painting, may be done on the runway landing. In fact, it is a paint shop of itself when the sun shines on a spring day.

(To be continued.)

Repairing Axles, Wheels and Springs.

Prize Article.

CHARLES D. BRIDDELL.

There are a great many smiths that want to know how to do certain kinds of work, while others know how to do the work, but I think in busy seasons when the smith is crowded with work, that if he knew just how to turn off the work faster and just as good, and with no more labor it would be of great benefit to him, for it would mean time and hence money for him.

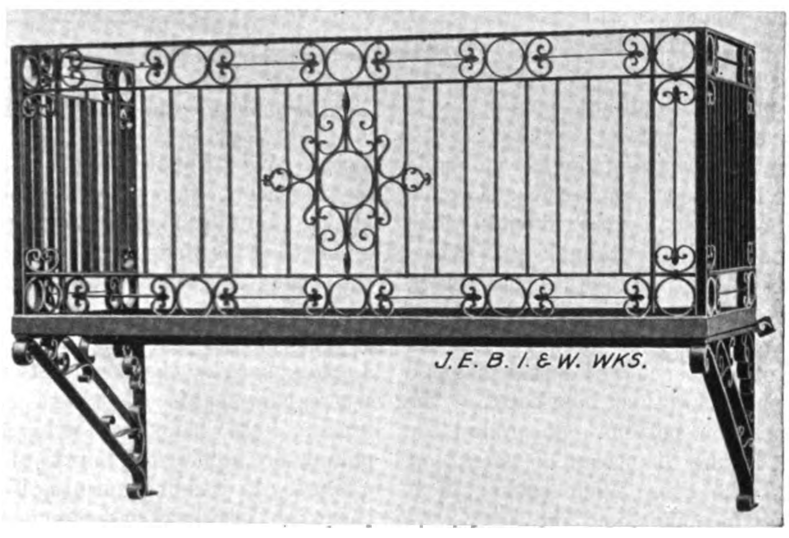
I will give one of my ways of saving time on handling vehicles from heavy farm wagons to the lightest kind of buggies. I have in my shop several hooks made fast to the floor beams of the second floor. Then I have what is known as the safety rope-hoist, one that you can lock at any height without making fast to cleats or holding it, as it is self-locked. A hoist of this kind will enable you to raise one thousand pounds. I have made hooks to go with it to fasten on to a wagon body or anything that I want to raise. A hoist of this kind can be bought from Sears, Roebuck & Co., Chicago, Ill., for the small sum of 80 cents, and the rope that it will take for its use will only cost about 75 cents.

If the smith has a new king-bolt to put in a wagon or buggy, he pulls the vehicle under one of the hooks, makes fast and with all ease raises up the front of the vehicle, giving all of the room that is wanted with no props or benches to bother.

Now we will say that we are going to put new arms on a wagon or buggy; this is the way I proceed. I pull buggy under hooks, make fast to the front spring, hoist wheels off the floor, take off the wheels, take out front axle, put two small benches under the body, lower down on them and proceed with the rear axle the same way.

The hoist can be used for anything that you wish to lift, and a great many other things besides.

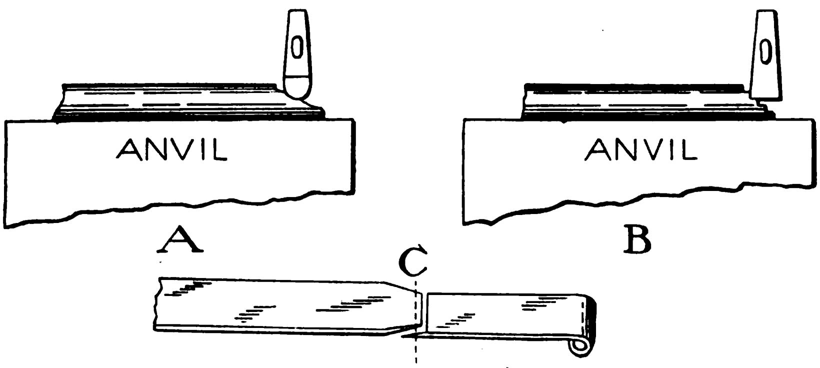
I will give my way of welding axles. To prevent them from slipping while welding, I cut them the length I want, allowing about $\frac{1}{4}$ or $\frac{3}{8}$ inch for welding. Chamfer with fuller, (see Fig. 1, A.) Then with a corner of the swage hammer make dents like stairsteps all along the scarf, as at B. Then take a welding heat, let your helper place one piece on the anvil and hold solidly, while you place the other on top. Then strike heavy, slow blows, put back in fire, take another welding heat, using Cherry Heat welding compound for axles high in carbon, and a little sand for iron or soft steel axles. After you have the second heat take out and weld up the edges and dress up the job. The way I scarf heavy axles is to first cut them the length I want, heat and draw with sledge hammer about one-third or one-half of the scarf, then take fuller with handle or top fuller, as you may call it, place on the axle and let helper strike (see Fig. 1.)



A SIMPLE, BUT HANDSOME WROUGHT IRON BALCONY.

This same method can be used on heavy tires with very good success, as the fuller only draws the iron endwise where the sledge hammer draws both endwise and sidewise.

I will now say something about wheels. For instance we have a set of wheels badly dished, from about one and one-half to two and one-half inches dish. To straighten them up I take off the tires; have the wheel screwed down solid on the wheel block and remove rim. Then I take and cut the tenons back a little, according to the amount of dish that they have, say about 1/16 inch for badly dished wheels. Then I remove every other one of the spokes and turn them around and drive up solid, by means of an oak or hickory block, with a hole of the same size as the tenon or a fraction larger. The way I remove the spokes is to thump a solid crack on the face of the spoke at hub to break the glue, and then work it out. When you put on the rim, bearing down on one spoke and raising upon the spoke you have changed, brings the wheel about straight. Then put on the tire. The reason you should cut some of the end of the tenons is to make the joints of the rims come together.



EXAMPLE OF AXLE AND SPRING WELDING.

In putting on tires I have two strong trestle benches made, and have a staple driven in the floor the same as you have for wheel blocks. Hook in wheel-block screw and run it through the wheel and screw down solid on benches, screwing the amount of dish you want in the wheel. Then put on the tire and cool it while on the benches by means of a pail with about a 5/16-inch hole bored at the side near the bottom. Go around the wheel, letting the stream of water pour against the tire. While cooling, if it seems to be a little too tight, saw a little out of the point of rim with a fine saw and strike a few solid cracks over each spoke. By doing this you can set spokes solid in hub. Putting tires on in this way, you have the wheel solid, and at the same time can get the dish just as you like.

The above rule of taking dish out of wheels is very good for Warner patent wheels, and shell-band wheels, and will work on Sarven patent wheels by removing rivets, but if your customer can wait a few days or a week, it is best to do it in this way: Remove tires and rims, cut some of tenons off as above stated, and drive rims back on. Screw down on bench, screwing the dish the other way, about the amount it was dished in the first place. Let it stay so for a few days; when you slack up the dish will be about right; then put on tires as above stated.

Now we will take the broken carriage spring to mend, one of the worst jobs that a smith has to contend with. He may make a good weld, but often the spring will break at the edge of the weld. For a good job, upset the end of spring a little, champer, and then with the corner of a sharp-ended hammer make the champer as rough as possible to prevent slipping while welding. Then take one piece of the spring and weld a soft piece of iron to it. Screw up in vise and file with a heavy file, across the point of the champers, as at Fig. 1, C. Then take another heat and weld up nicely. Weld the other piece of spring to the latter, filing the champers as above. I do this filing because very often when you take a welding heat on the spring, you will burn the thin edges of the champer. Then if you weld down to make the job smooth, you will make a weak place at the edge of the weld where nine-tenths of welded springs break. I use Cherry Heat welding compound or pulverized borax of good quality. In welding springs, if for a cheap job, just upset and champer both ends of broken spring, making rough with corner of hammer to prevent slipping. Take first heat and stick together, not trying to finish at one heat, but screw in vise and file as above. Then take second or third heat if necessary. In welding spring, have a clean fire and do not get your spring too hot, as it is not as injurious to the steel. After having the spring shaped like you want it, heat to a dark red and pour linseed oil over. This will toughen and harden the spring.

It always pays to finish up any work neatly, it gives a workmanlike appearance to the job and increases your reputation as a skilled mechanic.

Carriage Repair Work.

Prize Article.

J. VESTAL.

I shall start at the wheels and go up. A wheel comes in, tire loose and open spokes broken and needing half a rim. I first remove the tire bolts by cutting the nuts off them and drive them out. Then I mark my tire and rim on the inside, take the tire off, remove the wheel rivets over whatever spokes need to come out, put the wheel on the bench and fasten it down tight. I then remove the rim, lay it aside, cut a notch in top of the spokes that need to come out; and with a heavy hammer held under the spoke a sharp blow or two on top in the notch brings it out. If broken off short I bore a 3/4-inch hole, 3/4-inch deep or not deep enough to strike the hub. With a 1/4 or 5/16-inch bit I bore through to the box and remove it by a lag screw to pull it, or chisel and hammer.

Next I fit my new spokes snugly from one end of the mortise to the other. Dipping the spokes in good hot glue I drive them home all but one, which may need a little more fitting Get it snug, glue it and drive. Lay aside for glue to set. Then put in new wheel rivets, set the spoke augur to fit the old tenons on spokes and bore down the old spokes that are left in the wheel just enough to make a good shoulder on them. Then get the measure from them, mark and cut off new ones by them. Put back your old half rim that is good, dress up top side of new half rim, set your mortise gage for the outside point to the width of the rim and the inside point for holes. Mark and bore. Round up inside, glue tenons, put on rim and finish on the wheel.

Run the wheel and tire, and set with 1/4-inch draw. Wet the rim in water and don't set tire hot enough to burn wheel. Put in new bolts as they are too cheap to bother with old ones. After the wheel is dry, paint the new work with a coat of oil with a little white lead and black enough in it to make a lead color. Touch up all bare spots on the old part. After it is dry, sand-paper slightly and put on a coat of some good coach paint.

For a repair job you will find it all right.

We must now put on a new axle stub. Best and cheapest in the long run is to buy long arm axles and weld in center. I usually go by the old axle bed for length in repair work, but you can use the following rule: Take the distance from the front of the spoke on wheel to the butt of the hub, double the amount and subtract it from the width of track. That leaves what you want between collars. Say your hub measures 7 inches from the front of spoke to butt of hub. Take 14 inches from the track, say 62 inches. That would be 48 inches between the collars for a track of 5 feet 2 inches. Upset your stub ends good and heavy—it is better to get them ⅛ or $\frac{3}{16}$-inch short, for I set my axles nearly straight on front and bottom.

I then put on two wheels and measure with a straight edge from the butt of one hub to inside edge of tire on the other wheel. Reverse and see that both are alike. Measure top of wheel from centre of tire, and then the bottom, as they ought to set nearly on a plumb spoke. Next I clean off my axle and axle bed, glue the bed to the axle, put on six clamps to hold it and set aside to dry. With an old file, sand-paper and black putty, I fix the point so that it can't be seen.

As all clips and bolts were cut off when put on at the factory they need to be run over again with the plate and oiled so as to work well. After putting on tight I hit them a blow with a sharp riveting hammer so as to make them stay.

If the fifth wheel is not good now is the time to put on a new one. They don't cost much and you can get a good price for them.

Now we will mend the broken spring. Stave up both ends of the broken spring well and with the clipper cut or split the spring up ¾ inch. Scarf one ½ inch on one side and the other ½ inch on the other side. Fix a piece of another old spring the same way. When you put them together they fork in and when hammered down they hold good and fast. I use nothing but borax and clean sand to keep it from burning. I see that all the heat is applied on it at the point, hence am never bothered with its breaking above or below the weld. I take a slow, steady heat, and use no helper until I weld up good and get ready for the use of the flatter. The next step is to get the right length and fix the end of it to fit the forked end of the other part of spring and weld the same way. It is impossible to weld a spring so it will stand unless you put in an extra piece, as the spring will either be too short or to thin where the weld is at—hence worthless. If you have the spring to paint, do so all over, just alike.

If the job needs a reach, I make it just the size and length of the old one or mate to it. I bore my first bolt hole in one end, put the iron on the bottom and put in this bolt. With a twist bit that bores wood or iron I proceed to bore the balance of the holes by putting my bit through the holes in the iron first. By so doing I never get them too close or too far apart. Every time I make a hole I put in a bolt, and so on. I also prime all my work as I go with oil and lead. See that your spring or side bars hang perfectly snug and well-balanced. See that your body loops are all set the same and none sprung out of line.

The body now needs one side, one end and one sill. I first knock out the bottom, clean it off and put aside. Then with a ¼-inch chisel I raise the plugs from screw heads and save them. I take out screws, then take off side and end, and take out broken sill. Make the sill like old one, ash or oak, and see that you get the right bevels, and don't get the jogs too large. Now is the time to clean off all the old' parts you aim to save. Clean out corners well. Put on the joints with good hot glue, and clamp all joints tight. Do it as quickly as possible after you put on the glue. Put aside until the glue sets. After that put the screws in the corners of the frame and the uprights that support the seats. Now take a piece of poplar or magnolia wood ⅜ inch thick, lay it off and cut to fit. With the glue again, put it on all the frame that your side is to cover and clamp it tight. You may put in a few little pins—set them well with a nail set. When dry, bore for the plugs, put in screws, dip plugs in glue and drive them in. Be sure to get the grain of the wood in the plugs to run or set like the grain in the side. After the glue sets well, work plugs off even with the surface on your side. Then with a good sharp steel scraper and steel wool, get it all nice and smooth. Then I apply a coat of good wood filler and rough stuff. After it drys well, I put on my irons, rub this coat of filler with wool good and smooth. Dust off and apply another coat of the same.

I then look after the pole. We find it is bent down in the center too much, one brace is broken, and the doubletree bolt broken. I take off both braces and the circular bar with a very thin saw. I cut in at the little end underneath and rip this pole back past the bow that is in it, say a ¼ or ⅜-inch on the bottom. After I rip it back as far as need be, I take out my saw and put the pole in a place where my helper can sit on one end and spring it straight. While he holds it straight I take screws and hot glue, and fasten the piece. I then weld the broken brace by staving up well and putting in a short piece just a fraction larger in diameter than the brace is, so that I can swage down to proper size. I dress the point with a file while it is hot. Then I put on my circular bar and fasten the braces to it, but not to the pole, and with a tape line I line the pole from little end to the eye in the brace and see that it is in perfect line before I put in the upper bolts. After I get it lined up I then bolt lightly, put in a new doubletree bolt, and brace it slightly as they have a tendency to come off when in use.

The top needs a new lining, a bow and two sockets. I always keep in stock a few bows and a few bow sockets. They don't cost much. They come 29 and 30 inches long. I always buy the 30-inch, for if I need 29 inches I can cut off one inch. I take off top props, braces, etc., remove the main top, rip them, take out the old lining and put in my new bow, next the bow sockets. Then I put back top props and cut my lining as the old one was, sew it up and tack it back. Next I put on the roof, then the top braces, and with some warm water wash off the roof well. After it gets nearly dry I rub it off with a rag wet with tallow and sweet oil. After it sets I put on a coat of good make of top dressing; also on the dash and boot, and all leather parts, except back and cushions.

I now go back to my gear and proceed to finish up. I have primed all new parts and touched up all bare parts on the other. I now put in the pole, rub everything good and smooth, and apply a coat of good color varnish. Then I go to the body, put it up on a good revolving trestle, and rub it well. I putty up all joints and screw heads with colored putty, and put on a coat of varnish, the color that I want it to be, and after it gets good and hard, I take my sponge, ground pumice and chamois, and rub it down with good clean water. I dry off as I go with the chamois skin. The next day I go over it with a clean duster and a little hair, and clean it perfectly. Then I put on a coat of quick rubbing varnish, and after it dries well, I rub off again with hair, and then put on a coat of

finishing varnish. After it dries I hang the body to gear, put on the top, put in the carpet, dust off the cushions, put them in, and the job is ready to go out.

Read the trade journals and put some power in your shop, with a band saw, rip saw, boring machine and jointer, and see how easy it goes.

Wagon Building in the Factory.

Prize Article.—*Continued.*

NEILS PETERSON.

This factory carries about thirty-two hands in the trimming department. I will not attempt to describe in detail the methods for trimming bodies and seats, making tops, cushions, etc., but as my article would not be complete without mentioning some of the work done in this department, I will give an idea of how we start getting out a top for a buggy. Fig. 5 is a draft for a four-bow buggy top. First the seat must be set level. Then start draft on paper or blackboard by getting the square of the top, which, according to draft, is 45 inches high and 46 inches long. Then find the height of goose-neck from bottom of seat which is 6½ inches from base line. To locate goose-neck from rear to front, take the flare of the back into consideration, which on draft from rear base line to center of rear prop is 3½ inches. Then measure from center of rear prop to center of goose-neck, which is 16 inches. Then locate the flare of the back bow, which is found by placing straight-edge on a line with the back proper, at about 36 inches from bottom of shifting rail up. Then take plum bob, placing at upper part, letting it drop down, which will give about 3½ inches as indicated on draft. Then you have a line to go on to get length of top, starting from rear base line to the length of top wanted, which in this case is 36 inches. To get drop of front bow, measure down from top base line 6 inches, for second bow, 7 inches, for third, 8 inches. Run line to extreme base line. For fourth bow, drop 2½ inches. Then find the lower part of quarter line which is 11½ inches. Then get your bow sockets, place eye of socket directly over goose-neck on draft, spread them out, making sure that the outer edges of front and back socket do not extend over draft lines. Having done this, measure from top ends of socket to top of bow, as is indicated on draft. Then take a piece of paper and set down the figures as follows; First bow, 5½ inches; second bow, 7 inches; third, 8; fourth, 6½ inches. Those measurements are for the wood-worker to get an idea where the bows meet the socket ends, he measuring from top of bows. He would then have to find where the filling comes, on inside of socket, and add that measurement to the measurement given him from draft on paper. Then he would have, after fitting bows and driving them to the measurement given, a set of bows ready for props.

The prop measurement can be had from draft, and put on some paper for the wood-worker. To get props on drafts, take one front and one rear prop, place front prop on front bow with bottom edge on quarter line; place second prop on third bow ⅝-inch from top of quarter line. Then take measurement from top of props to top of bows as indicated on draft, giving measurement for first prop and second prop. Put those measurements on paper with draft for bows, and have wood-worker put on prop after having fitted bows. We now have bows ready to set up on seat from which the draft was taken. Get some stout cord, fasten to shifting rail, run over and around fourth bow, in like manner over the other bows. Then fasten to floor in front of job. Next proceed to spread bows, commencing with back bow, making sure that your have the right flare with the back proper. Then take measurement from extreme outer edge of back bow to extreme outer edge of front bow. Then divide second and third bow as per draft, which should be equal distances from each other, having your top cord very tight so as not to let the bows slip away. Now having made your measurement correctly according to draft, your bows and props should come all right, ready for joints. Having your props in position held fast with top cord, you proceed to get measurement for rear or long joint. To get draft board ready for blacksmith, get a nice, plain board about 5 inches wide, 1 inch thick, and about 36 inches long. Drive in one end two ordinary drive knobs, where the upper eye of joint should come, on draft board. Then draw a heavy pencil mark on a straight line from knob to the exact length of the long and short joints. Now go back to your top, take measurement from rear lower prop on shifting rail to upper prop on third bow, using center to center measurement. Take this measurement to joint draft board, getting exact measure from knob driven in board to another drive knob, which will indicate the lower eye of long joint. In a like manner you get measurement from prop on third bow to prop on first bow. To get break or knuckle of joints, get two pieces of leather dash, punch one hole in leather the size of props, and one hole large enough to run a piece of tufting twine through. Make two of them, put one on lower prop and other on upper prop on third bow, and run twine from one leather to other on different props. This is to represent joints. On rear or long one tie on a loose piece of twine so as to shift it on long twine to represent

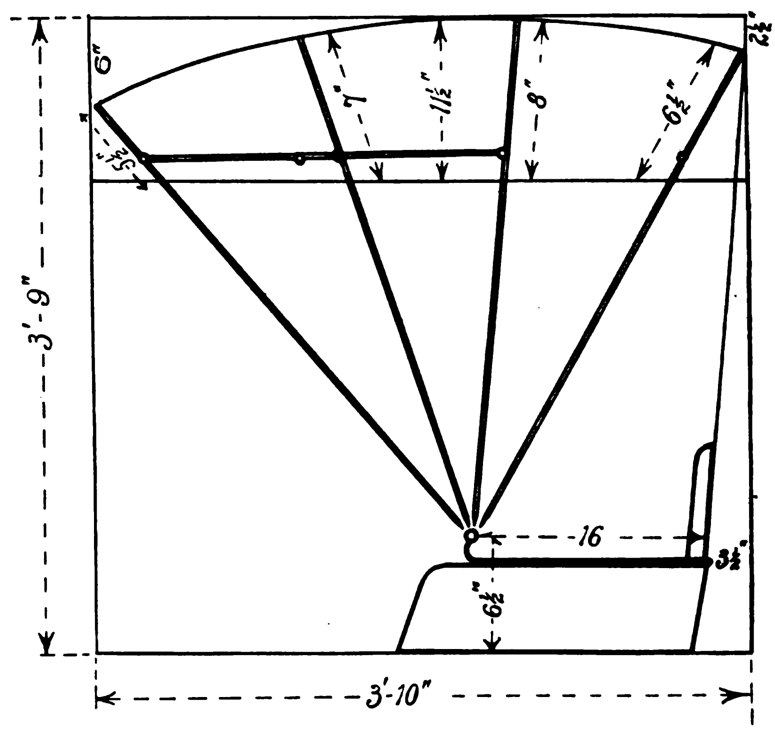


Fig. 5. LAYING OUT A BUGGY TOP.

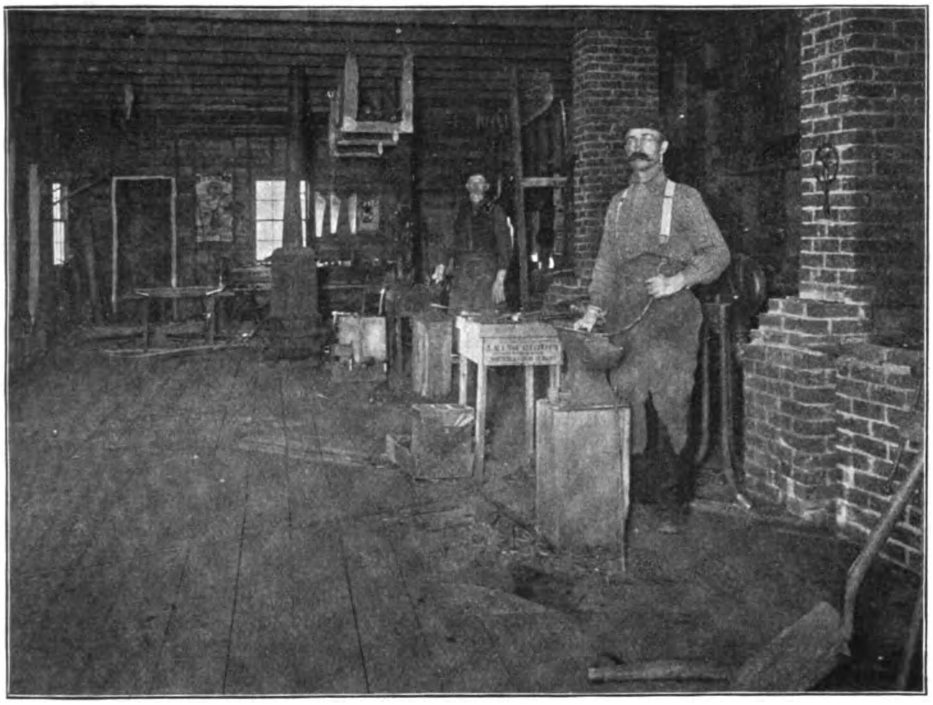
knuckle. Having the long piece of twine drawn to you, now loosen your top cord, drop top to position. When folded you can then adjust sliding loop to where the knuckle should come. Take the latter and twine off the top gently, take it to your draft joint board, placing your leathers over knobs. These on, drive a japan nail where the knuckles should come on draft board. In like manner you take the leathers with the twine attached, placing them on first and second props to get the short joints. Having your joints made and put on top, the top is now ready for the trimmer. Time and space forbid describing the methods for trimming top.

The various parts finished, the job is set up in the assembling room, the wheels and washers put on, axle nuts tightened up, the wheels tested to see that they turn without binding, the body put on, the gear and loop bolts put in dash, lamps, rub-irons and steps bolted on, bolts trimmed off. The top is then put on, back-stays and side curtains fitted up, fender irons bolted to the steps and fender irons fitted to place. The job is looked over to see that each and every piece is on properly, is then inspected by the superintendent. If satisfactory, it is taken to the elevator and brought down to the shipping room, the floor of which is on a level with the floor of a box car, standing on the track. The wheels are then taken off and crated, the top taken off and let down, resting on the top of the seats, and secured with ropes, a crate built over the job and sent to its destination. I feel that the above description of wagon building in a shop of some size will be of interest.

An Illinois Shop Where There is Plenty of Light.

ELMER WHEELER.

I have recently finished building a new shop. One feature that we are proud of is its good light, it having ten good sized windows. Smiths, as a rule, are not particular enough about having plenty of light, and I am certain that I have injured my eyesight by working in dark shops. We also have two large lamps, by the use of which we are able to work until six o'clock on wintry evenings. A picture of our shop is shown here.



INTERIOR OF SHOP OF MR. ELMER WHEELER

One year ago last November the horseshoers and blacksmiths of Edgar County, Ill., met at Paris, the county seat, organized, and raised our prices all over the county to correspond to the advance in prices of other things.

The paper has been very helpful to me in my work, beside the enjoyment I get in reading its columns.

The Progressive Smith as a Business Man.—6.

BILLY BUNTZ.

Buying.

Not only does a smith need to be *progressive* in order to obtain the best supplies or tools, but he must be *shrewd*, a clever business man.

When buying, *something* should be known as to the reliability of the dealer or manufacturer from whom an article is bought, as well as whether the article itself is first-class, for, where these conditions are unknown, costly purchases oftentimes result. The shrewd smith writes his brothers to obtain their opinion of an article or its dealer, as no brother could have good reason for misrepresenting the facts.

It may be said, too, that the smith need have no misapprehension of the dealers or manufacturers who advertise in THE AMERICAN BLACKSMITH, as they are as honest and as reliable a class of advertisers as could be found. In contradistinction, he has but to read some of the "Cheap John" journals and magazines with their "catchy" advertisements. Such papers are usually published under some big-sounding title, while the publisher knows many of his advertisers to be unreliable or on the lookout for unwary folk. (The smith who buys from advertisers should read this paragraph a second time—Ed.)

To enable him to describe just such goods as he wants to buy, he can learn much by studying his work and the material he has been using, as, for instance, by observing the tempering, bending, pulling, etc., a certain grade of iron or steel will stand; or his experience may have taught him that it is best to apply a tire a certain way, hence, in buying a setter, he would want one that performed the work in accordance with his experience.

An article of first quality should be compared with its price. Although prices may vary, so also does quality, while some goods sell on their *name* at a standard price. However, it is a fact, that several samples of goods of the same kind but selling at different prices may not be readily distinguished, one from the other, when placed side by side.

The rule, "Learn to Do by Doing," is not altogether a good one to follow in the purchasing department, although many old-time business men, by keeping wide awake and studying the cause and effect of every transaction,met with considerable success through the avenue of practical experience; but as experience is a harsh teacher, sometimes even a costly one, the shrewd smith deems it wise to follow a few well-established principles, such a those previously mentioned, rather than to go haphazard or buy something offhand and then find he paid a handsome price by being hasty or rash.

Before buying new tools or machinery, it is well for him to study the class of work he wishes to perform, and, having satisfied himself as to the most feasible way of doing it, proceed to find what make of machinery his brothers are using, as well as mail a postal for the catalogues of different manufacturers.

He should remember that manufacturers cannot consistently recommend a machine to give "satisfaction," as the service which any machine will render depends to some extent upon the way it is operated. As a rule, tools and machinery are guaranteed to come up to a certain specified standard; therefore, if they are not handled properly the manufacturer cannot justly be blamed.

When quotations read "F. O. B." a certain city, he knows that when goods have been delivered to a railroad company, the purchase has been fully made, provided he has promised to buy them or paid the cash. Should they arrive in a damaged condition, the railroad, not the dealer or factory, is responsible, and claim for reimbursement must be sent to the transportation company. Goods are usually O. K. and well-boxed when presented for shipment, otherwise the railroad has the right to refuse to transport them. "F. O. B. Factory" also means that purchaser pays freight charges.

Knowing just what kind of tool he needs for certain work, and a good firm from which to purchase it, the smith is not likely to make any serious mistakes. He may buy of dealer or manufacturer, although machinery such as a trip-hammer or gas engine is more generally bought from the manufacturer direct, as he is in better position to explain the setting, operation and details of his machine than anybody else. However, large manufacturers have reliable representatives in many sections of the country. THE AMERICAN BLACKSMITH contains ads of standard-build engines and trip-hammers.

Where the smith wishes to become agent or dealer for the machinery purchased, he should mention this when asking for catalogue, as he may be offered special inducements; anyway, most manufacturers fit their agents out with printed matter, placards, electrotype for letterhead or advertising, etc., while he would lose nothing if he afterwards found he was unable to make any sales. However, a progressive smith makes a good agent for farm machinery, heating-furnaces, cutlery and other lines.

Read Chapter 7, of this series in the next issue of THE AMERICAN BLACKSMITH, entitled "Selling."

The terms "agent" and "dealer," although meaning the same in general, yet, technically, an agent is usually a direct representative of a firm, for whose acts the firm is responsible; while a "dealer" is one who handles goods for another and responsible unto himself for what he says, because he simply buys to sell again. Generally, a "dealer" can hold a firm responsible only on its written or printed statements.

Aside from smithing, he may use shrewdness in all transactions of daily life, therefore it is deemed timely to give a couple of examples of how the unwary are sometimes fooled, somewhat as the Swede who bought an English book of a glib agent, although he could not read a word in it. Sometime an unshrewd man may sign an insignificant looking scrap of paper which says little, yet which afterwards proves to contain all the elements of a "full-grown" contract, as a chattel mortgage, etc.

Beware of the oily-tongued individual who has some brilliant proposition to make. A man who entered this arena found that the gate which swung open so easily had a spring lock that forestalled any departure, somewhat on the principle of a rat-trap. It is not overstating facts to say that in our day there are more seductive, ingenious, high-sounding, "hot-air" schemes for taking a man's money away from him, than at any epoch since creation. So smooth are some of these individuals that a Court of Justice can only say of them, "They're doubly-shrewd," hence the necessity for the smith being ***trebly so***. Who are these concerns; what do they handle? Read some of the inferior papers that do not guarantee their advertisements.

(To be continued.)

Shear for Cutting Off Iron.

LEO J. BRUNNER.

The sketches shown here are of a shear to be used on a steam hammer. In a shop where there are no shears this will be found to be a very valuable tool for cutting off iron cold. This sketch represents one of the shears I am using for cutting off iron from ½ to 1¾ inches round. I also have one for cutting off two inches round and one for flat iron I have an eight-hundred pound hammer with which I can cut two-inch round or four by one-inch flat iron with two or three blows.

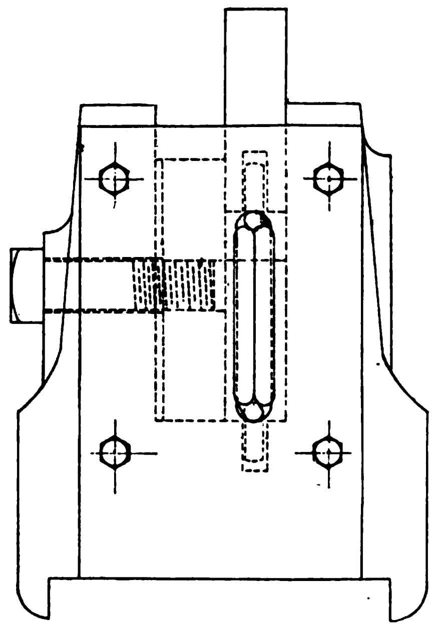


Fig. 1. THE ASSEMBLED SHEAR. SIDE VIEW OF UPPER SKETCH IN FIG. 2.

The upper view in Fig. 2 shows the tool as put together. The lower views show the details. I have given no sizes for the reason that it will have to be made to conform with the size of the hammer on which it is to be used. A is the base that fits loosely on the bottom die of the hammer, A being a right side view of the piece. It is a steel casting. B is the bottom knife, which fits in the base and is held in place with two ¾-inch tap bolts marked F. C is the top knife, which works loosely between bottom knife and side of base and is held in place by a spring on each side, a hole being drilled in bottom of the knife and in bottom of base as per sketch, large enough to receive the bent ends of spring loosely. The knives are made of good shear steel. The springs, E, are made of ⅜-inch round spring steel. The guide plates for springs on end of the base marked D are made of 3/16 or ¼ inch tank steel and are held in place by four ½-inch tap bolts, as shown. Narrow slots cut in these two plates allow the spring to work up and down. The cutting edges of knives should be filed back a trifle for clearance to make them cut better. If the above is not clearly understood I will be pleased to explain further.

Gas Engine Power Versus Steam Power.

BILLY BUNTS.

The immense advantage the gas engine has over the steam engine as a direct power-producer in the smith shop, admits of no argument. In fact, the whole story is told when it is stated that the gas engine costs only from one-third to one-half what a steam engine

does for fuel; that the few repairs it may need from time to time are as nothing in comparison with those necessary on a steam engine; that, being a simple power—yet a thoroughly efficient one—it requires no engineer or mechanic to run it; in fact, little if any attention need be given its operation, as it practically runs itself.

The loss in fuel energy by a steam engine is readily accounted for and the fuel extravagance demonstrated when the performance of the boiler is measured in thermal units—a thermal unit being the heat required to raise one pound of water one degree Fahrenheit. Recently, a practical test showed that out of 13,500 thermal units only 1,171 were delivered to the belt, the balance being lost in ashes, gases, exhaust steam, radiation from boiler and pipes, etc. In other words, it takes a pound of coal to evaporate every eight or nine pounds of water, or, out of a hundred pounds of coal burned to make steam, only from six to twelve pounds actually produces power on account of the loss of energy mentioned above.

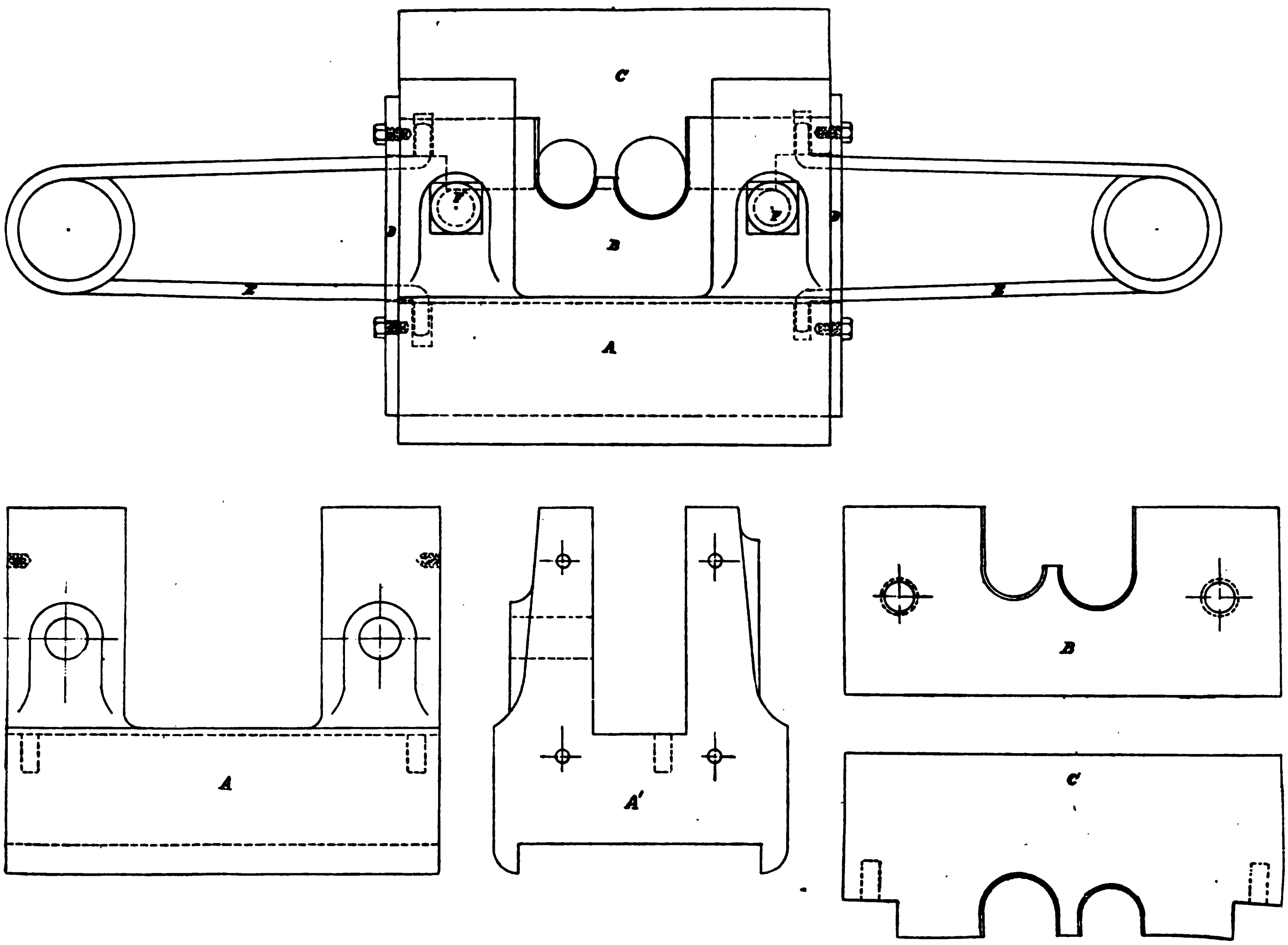


Fig. 2. UPPER VIEW IS A SIDE ELEVATION OF COMPLETE SHEAR. LOWER VIEWS ARE DETAILS OF PARTS.

In order to gain a unit or two in fuel economy with a steam engine it is necessary to install a fuel economizer, a feed water purifier and heater, temperature or other regulators, indicators, soot-suckers, etc.

Without going into any elaborate figures, suffice to say that a small gas engine will run all day on a gallon or two of gasoline, which, with gasoline at say twenty-five cents a gallon, means only fifty cents fuel expense for running several small machines, such as emery wheel, trip-hammer, drill, saw and blower.

Again, with the steam engine, there is the question of repairs—keeping the fire box, boiler, flues, smokestack, as well as the engine itself, in serviceable condition. This cost is difficult to determine, yet it is absolutely certain—"a dead cinch"—that the gas engine, with only a piston, connecting rod and a crank to repair, is the cheaper on repairs, even were it necessary to renew these parts every six months. The fact is, however, that nearly all gas engines are guaranteed by their builders against defects for one or two years, as a good gas engine will easily run from two to six years without any repair at all, when it is not overloaded, is kept clean and given attention as to oiling.

In fact, a gas engine cannot be approached by any other power for efficiency in the smith shop. It delivers 35% of its fuel energy to the driving pulley, while the steam engine delivers only about 10%. Generally speaking, the repairs of a small gas engine would cost no more than a dollar a year, and they may be made by the smith himself, such as renewing a cylinder ring, repacking a journal box, readjusting the connecting rod for any lost motion, etc.

A small gas engine costs only $100 or $200 and will practically last a life-time if properly cared for.

There are many cases on record where steam engines have been replaced by gas engines, principally to save the cost of an engineer's services, where, after a time, it has been found the fuel bill is only half what it was when coal was used. For small powers, gas or gasoline engines are cheaper.

The Passing of the Horse.

Every little while they tell us that the horse
has got to go;
First the trolley was invented 'cause the
horses went so slow,
And they told us that we'd better not keep
raisin' colts no more;
When the street cars got to moting that the
horses pulled before.
I thought it was all over for old Fan and
Doll and Kit.
S'posed the horse was up and done for.
But
he
ain't
went
yit!

When the bike craze first got started people
told us right away
As you probably remember, that the horse
had saw his day;
People put away their buggeis and went
kitin' round on wheels;
There were lots and lots of horses didn't
even earn their meals.
I used to stand and watch 'em with their
bloomers as they'd flit,
And I thought the horse was goin',
But
he
ain't
went
yit!

Then they got the horseless carriage, and
they said the horse was done,
And the story's been repeated twenty times
by Edison;
Every time he gets another of his batteries
to go
He comes whoopin' out to tell us that the
horse don't stand a show.
And you'd think to see these chauffeurs,
as they go a'chauffin', it
Was good-bye to Mr. Dobbin,
But
he
ain't
went
yit!

When the people git to flying in the air I
spose' they'll say,
As we long have been a-sayin', that the
horse has had his day,
And I s'pose that some old feller just about
like me'll stand
Where it's safe, and watch the horses haulin'
stuff across the land.
And he'll mebby think as I do, while the
crows above him flit,
"Oh," they say the horse is done for,
But
he
ain't
went
yit!"

—*Exchange.*

HEATS SPARKS WELDS

March—by no means spring yet.

Do today what you could not possibly have done yesterday.

Keep a hustling—success comes to no man without persistent effort.

A name for honest dealing is often worth more than a big bank account.

Any complaints to make? Send them in. Glad to have them and to straighten them out right to your satisfaction.

Russia has the largest number of soldiers and reserves of any country on earth except Germany.

Gas, oil or coke—which do you prefer for your heating furnaces? Let us hear from you as to your experience.

Good timber for rims, shafts, bows, spokes and other vehicle parts is reported to be very scarce at the present time.

Corruption is declared to be unknown in Japanese politics. Japan is indeed far removed from the United States.

Put your eggs all in one basket and then watch that basket. Thus spoke Andrew Carnegie,—and he ought to know.

When your engine balks in cold weather, remember that the colder it is the less freely gasoline vaporizes.

Prizes to the extent of seven thousand dollars will be offered at the World's Fair for exhibits of French draft horses.

Have you written that article on power in the shop? Of course you are going to try for one of the prizes—not much time left however.

The cottage in which the grandfather of the late President McKinley was born, in Ireland, will be reproduced at the St. Louis World's Fair.

Anthracite coal to the extent of over forty million tons, together with two hundred and sixty millions, was produced in the year 1903.

Doomed to disappear is the Eiffel Tower in Paris. This renowned structure, towering a thousand feet in height is to be razed, because it is beginning to lean to one side.

Be sure you know just exactly which machine is right for your purposes, then go ahead and place your order for it. No mistake is made in getting labor saving tools for the shop.

What steps have you taken for better prices in your locality to correspond to the higher cost of supplies? Some smiths seem to think prices for work will raise themselves. Is that your idea, too?

A high wind blowing at the rate of thirty-five miles per hour is estimated to exert a pressure of about six pounds on every square foot blown against.

No two horses have feet exactly alike. General shoeing rules may apply in most cases, but the details in each case will vary. It is always a help to observe the horse in motion.

New tools don't pay. The man who says that is in the same class with the one who says advertising doesn't pay. It's equivalent to declaring against progressiveness. New tools don't pay unless you want to get ahead.

Tom Tardy's latest acquisition is a horse. We found it standing in a rude stall clumsily made of old planks in a far corner of his shop. What Tom wants with a horse no one has discovered and Tom hasn't seen fit to say anything about it yet. In appearance it is like most of his customers' horses, more bones than flesh.

Gasoline mixed with the proper quantity of air will burn; but, like gunpowder in order for it to develop its full power it must be confined and compressed before igniting. The power is a direct result of high temperature which is generated in a limited space.

An ancient statue of a blacksmith has recently been unearthed in France, dating back to the first century after Christ, when the Romans held supremacy over the Gauls. It is interesting for the testimony it incidently bears of the blacksmith's importance in those olden days.

Electricity has been applied to the production of iron and steel, very high temperatures being attainable by its use. The high cost of electrical energy, however, has prevented these processes from passing much beyond the experimental stage, up to this date.

This month will be a good one to try to get at least one new subscriber to The American Blacksmith. You do us and your brother smith both a good turn when you induce him to take the paper. And remember, we offer a reward for your trouble, no matter if you get but one new name—a prize of $25.00 is offered to him who sends the greatest number before April 1st.

The Japanese Army in time of peace numbers 421,000 men. Private soldiers are paid seventy cents a month, so that the cost of maintaining an army is not very great. They are fed on rice, salted fish, dried seaweed and pickled plums—a diet that is almost universal in Japan, except in the navy, where rations of meat are served. Soldiers are allowed meat when on campaign, but rarely eat it.

Afraid to move. That's the case with many a smith. His jobber, not being in business for health, insists on payment when bills are due. His farmer-customers threaten to take their trade away at the first suggestion of a raise in prices; they let his bills lie, so that the only thing collected on them is dust; and they ask good cash prices for anything the smith buys of them. And yet the smith is afraid to make a move in the direction of higher prices, better conditions and just deserts.

The veterinary profession today is one of the few that is not overcrowded, and good veterinarians in large cities command from $5,000 to $20,000 a year in wages. The practice of this profession has made many advances of late years, and cases are now undertaken which a few years ago were thought to call for shooting. Where the patients are race horses of value, the "vet" is sure of a substantial fee. A story is told how a certain owner, whose horse had been successully treated, placed a fifty-dollar bet at odds 20 to 1, for the veterinarian. The horse won its race, and a substantial addition to the surgeon's fee.

A great problem now confronting railroads is the supply of lumber for ties. It has been estimated that an area equal to that of several states would have to be devoted exclusively to timber growing in order to provide the ties necessary for future new and repair work. The present supply is being rapidly depleted. Experiments have been made with steel and concrete ties. Another proposed solution is the catalpa tree, common in Illinois and Indiana. Its growth is extremely rapid. Catalpa ties in use for over thirty years have shown no signs of decay, whereas the average life of the oak tie now used is but little over seven or eight years. The gain is apparent.

American Association of Blacksmiths and Horseshoers.

For a number of months we have been agitating the subject of better prices for blacksmithing, and under plans furnished by us the work has been taken up in many localities. Not in every instance has it been found possible to get every single craftsman to join the proposed branch association, and indeed this is not to be expected at the start. But in almost every case a strong, whole-hearted effect in a given locality has resulted in higher prices and better conditions for a body of smiths.

We wish to point out here that we must not expect in a day or a week to change conditions that have existed for years. Patient, persistent effort is necessary to bring complete success. Those who do not at first fall in with the idea of organizing must be labored with, or rather educated up to the benefits of membership in the Association.

Do not forget that much good is almost sure to flow from any attempt to organize. Enthusiasm and energy should be given the work at all times. There is scarcely any locality where things could not be improved by the blacksmiths and wagon men getting together. Every smith knows perfectly well what he *ought* to be getting for his work. Think what a slight increase on each piece of work would mean. He might then be able to give his family some of the good things of this life, and not merely the bare necessities. Perhaps it would mean a better education for his son or music lessons for his daughters. Isn't the effort worth while? Any smith can make a start of the movement for better prices in his neighborhood. Drop a postal to the American Association of Blacksmiths and Horseshoers at Buffalo for plans to follow in carrying out the work.

One of the many questions which greatly affect craft welfare is,—what about the "botch" workman, the man who shoes for ten and twenty and whose work isn't worth any more than that? Legislation is being aimed at such as these, with the idea of protecting skilled workmen by forcing a man to stand examination before he can practice. We invite discussion upon this topic. What is the best solution of the problem?

We wish to refer briefly to some of the active Association work. The movement for better prices which has been agitated in central New York during the past month or two took shape early in February. Cayuga, Seneca and Tompkins counties branch associations were organized and are growing in strength with each of the frequent meetings now being held throughout the counties.

Much good work has been done throughout New York State in arousing State representatives to the urgent need of Lien Law legislation. Those New York craftsmen who have not as yet written to their representatives at Albany urging passage of the bill, should do so the very day their eyes fall upon these words. We hope for early action upon the measure.

How One Smith Managed to Prosper.

Some years since a couple of young blacksmiths had learned the trade in one of the Eastern States, and after their apprenticeship worked together as journeymen. When they had saved up a stake, they concluded to come west, locating each one on the line of the C. B. & Q. R. R. in county seats in Iowa, about fifty miles apart. A short time ago one of them decided he would pay his old chum a visit, and came down to spend a day with him. Going from the depot he was not long finding the shop of his friend, and then the following conversation took place:

"Hello, Tom, old boy, how are you," as he entered the shop and found his old chum busily pounding away on his anvil. "Why George, glad to see you. It is some years since we came out here together, and how are you, and how have you been making it?" "Well Tom, from your surroundings I have not done so well as you appear to have done. Why, you have a dandy new brick shop, large enough for all purposes, a fine gas engine, a power drill, a good lathe and every tool necessary to do any kind of work that comes to you. I am plodding along in the old place, have plenty of work, but somehow I do not make the showing you present. I have been industrious, worked hard, saved my money, but have too much on my books, and not enough in my shop. I can't understand it. The county I am in is just as good as this one you are in. We have the same number of shops you have, but somehow, I cannot make the showing you do. Tell me how this is." "Well, George, come up to the house and spend the night with me, see Mrs. Campbell, my good wife, and our little family, and perhaps I can give you a pointer."

After a hearty reception from Tom's good, smiling wife, and a supper served up by her for her husband and his old chum, the evening was spent in detailing the ups and downs of work from the time they parted up to that evening. The cheerful supper done, George was ready to put his old friend in a way to mend his condition. "Well, Tom, up to three years ago I plodded along with all the smiths here in our territory, just as you have done. Had plenty of work, made money enough, but it was scattered all over the neighborhood, in the hands of farmers mostly, whose bank accounts would run from $500 to $5,000 of deposits, while we could not get enough cash from them to pay our bills and keep the wolf from the door. Three years since, in October, I had corralled three pigs, which I intended to feed and fatten for our winter's meat. A farmer came along one day, who had a large crop of corn, and I asked him to bring me a load. He would bring a load of corn for me, he said, but must have the cash for the corn as soon as delivered, for he could get cash from the shipper; this in spite of his owing me for work from the previous January enough to pay for half a dozen loads of corn. Like the boy after the woodchuck, I must have the corn, as the pigs must be fed, but it set me to thinking. I called on my nearest blacksmith neighbor, told him my story, and we together went to the third shop, at that time there being three shops in the town, and the experience of all of us was the same. We put our heads together, and concluded something ought to be done. Alek Crandall, one of the smiths is somewhat of a philosopher, and he said, 'Well boys, we are up against it, and we want to organize. Organization is the order of the day, and from organization has come the prosperity we are enjoying in America at this time. Let us be friends, let us organize, and let us get the smiths in our township and from the township to the county, and see what will come of it.' We had a meeting of the smiths in the township and harmony from the first prevailed. The first move we made was to say to our farmer friends, 'You insist on cash when you deliver any product of your farm, and you are right; we have concluded that our material and our labor are what we must depend on, and from this date we will insist on settlement of our bills when the work is done.' Our farmer friends went foraging around to all the shops to break the combination, but we stood pat, and in a very short time, after a few meetings, we not only insisted on our money, but revised

prices. Well, from that came my new shop, the engine and all the fine tools to do any work that comes in, and the other shops also have the same increased machinery and tools. So I want to say to you, Tom, that the first thing you do is to organize the smiths in your township and county, and in a short time you will have everything just as you see it here. Try it and don't let anything stand in the way of good fellowship among the smiths in your county."

A Simple Farm Wagon and How to Build It.

J. LAWRENCE HILL.

With this issue we present the working drawing of a farm wagon of simple construction, one which any blacksmith with a few tools can build. One of the advantages and novel features is the arch, or wheel house. This does not go through from one side to the other, but only part way, thus giving plenty of lock and increasing very materially the carrying capacity, besides permitting of articles the full length of the wagon being carried without protruding over the rear end.

The easiest way to build the body is at first to pay no attention to the arch; just cut sills or bottom sides full length, and frame into back bar. Gage ½ inch on the top, from the outside of sill and chamfer this off. The panel is then placed on top of sill close up to the chamfer, and is screwed up through the sill with 3-inch No. 16 screws, about 9 inches apart. The top rail is put on in precisely the same manner, but in addition it is mortised on to the back corner pillow and extends beyond so as to form a scroll.

The back pillow is mortised into the back bar and is screwed by a strap bolt screwed up underneath the bar. This pillow and the top rail is ½ inch wide, the panel only one inch, so that a rabbet to receive the panel has to be cut out in order that the panel, top rail, and corner pillow will be flush on the inside.

By referring to Fig. 2, A, which represents the half front view, it will be noticed that the front board is not so high as either the back or sides, but it has a rail all the same. A recess is cut into the side panels in the front to enable this front rail to go right through and beyond the side panels. The front panel is placed on the front cross bar and butts up against the side panels. This is screwed similar to the side panels.

Through the front end a $\frac{7}{16}$-inch bolt is put through the panel-rail, cross bar, and sill, making a most secure and strong job, as shown by dotted lines in Fig. 1.

In building jobs with an arch in them, some men prefer to hang it up, that is, put the gear under before cutting it out. They revolve the front wheel around, and mark on the body where it is to be cut through. This is not necessary with a good drawing, so that if these measurements are adhered to the arch can be cut out while the body is still on the trestles. From Fig. 1 we obtain the size and shape on the outside, and from

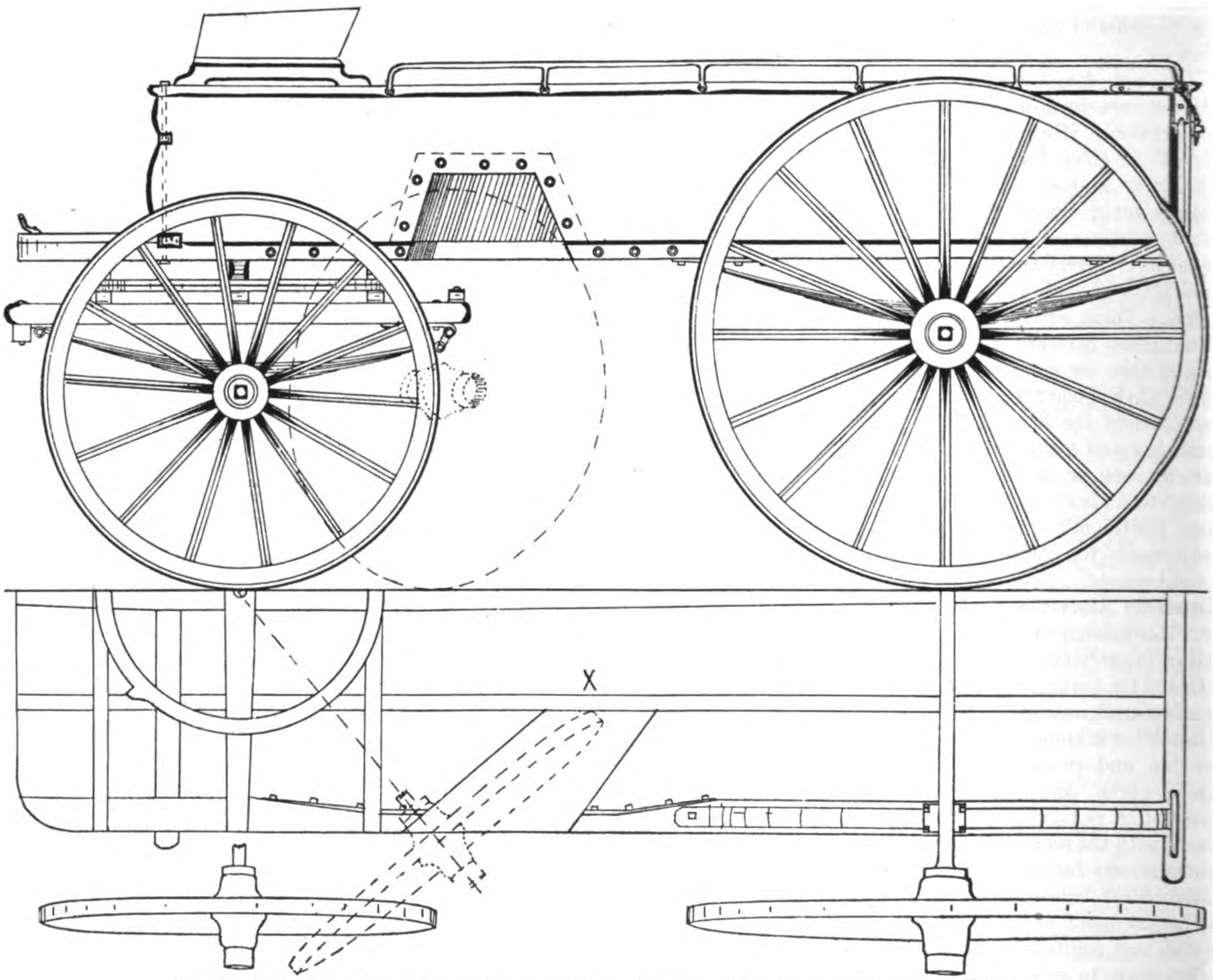


Fig. 1. SIDE ELEVATION AND HALF PLAN OF SIMPLE FARMER'S WAGON. SCALE, 1 INCH EQUALS 18 INCHES.

the plan view we get the inclination, or the size and shape on the bottom, which is determined by the wheel as it revolves round the king bolt.

The sill is 3½ inches wide; ½ inch is taken up by the chamfer, and one inch by the panel which leaves 2 inches from the inside of the panel. Get some hard wood, 2¼ by 1 inch and fit it on to the sill and against the panel, as shown by dotted lines round the arch in Fig. 1. There remains then 1 inch on the width of sill, which is cut off even with the hard wood framing in the shape shown in the plan, Fig. 1. A good stiff rocker plate is then made, 2¼ by ½ inches, and bolted to the panel and sill. The arch panels are next put in, and then the bottom boards.

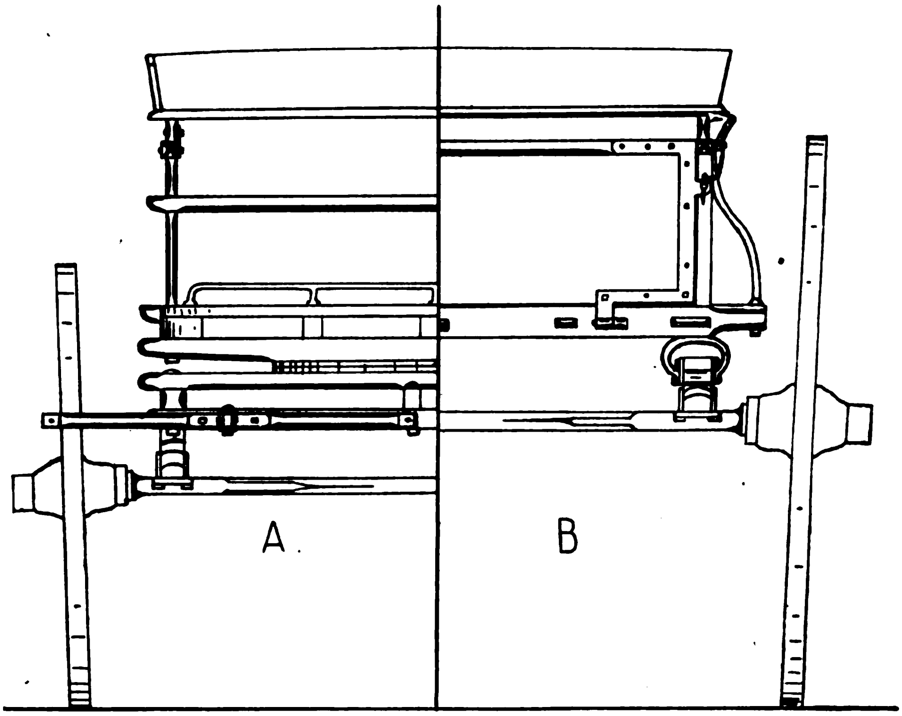


Fig. 2. A, HALF FRONT VIEW. B, HALF REAR VIEW. SCALE, 1 INCH EQUALS 18 INCHES.

In the bottom plan, Fig. 1, there will be noticed a lug on the top part of the fifth wheel. This is to prevent the wheel striking and eventually cutting through the stringer at X by coming in contact with stop Y, Fig. 3, which is welded on to bottom half of fifth wheel.

In Fig. 3 will be noticed one of the simplest of gears; every piece is straight—even the single-trees are cut out of the plank with a square ferrule on each end, and chamfered. There is nothing in this job, with the exception of springs, wheels and axles, but what any country blacksmith could make; and not only make, but easily and cheaply repair, for there are no bent or curved pieces to break, which to replace are a source of trouble to the small repair man, when he has to cut all his pieces out of the plank by hand.

Fig. 4 represents a sectional view of the back bar, showing how the sill is tenoned into it. The plate, which is screwed on top, prevents the wood from wearing with the constant putting in and taking out of heavy materials.

The drawings are all to scale, one inch, on all except Fig. 4, representing 18 inches; on Fig. 4 one inch represents one foot.

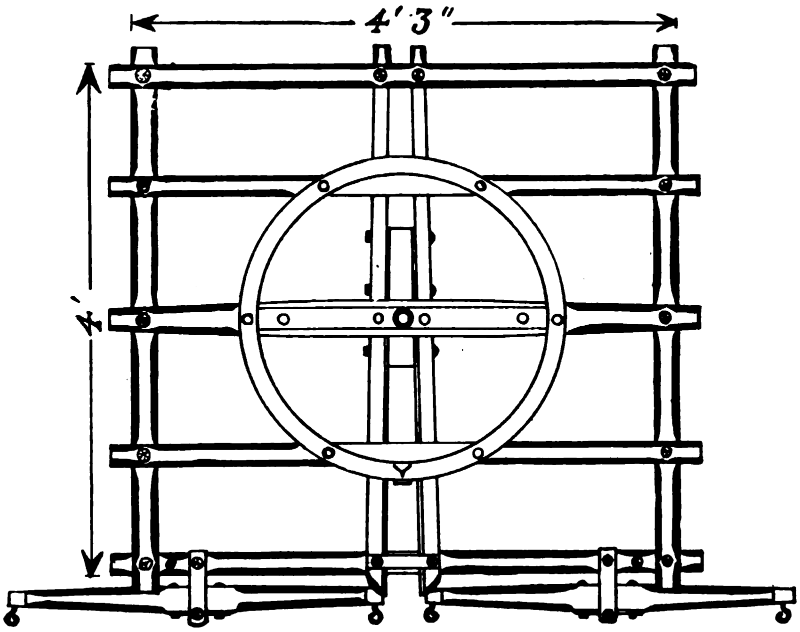


Fig. 3. PLAN OF GEAR. SCALE, 1 INCH EQUALS 18 INCHES.

The following dimensions will give the principal data needed, and other dimensions can be scaled off the drawings:

Body, from outside back to front bar, 9 ft.

Toeboard, 14 x 1 inch.

Body, width 4 ft. 3 in.; height, 18½ inches.

Sill, 3½ x 1⅞ inches.

Center stringer, 4 x 1⅞ inches.

Taper to each end from fifth wheel.

Back bar, 2⅝ x 1⅝ inches.

Front bar, 2⅝ x 1¾ inches.

Rails, 1½ x 1⅛ inches.

Wheels, Sarven:

Front, 3 feet 6 inches. Spokes, 2⅛ inches. Tires, 2 x ⅜.

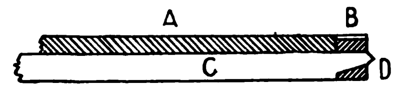


Fig. 4. A, BOTTOM BOARD; B, ⅛-INCH PLATE; C, SILL; D, BACK BAR. SCALE, 1 INCH EQUALS 1 FOOT.

Hind, 4 feet. Spokes, 2¼ inches. Tires, 2 x ⅜.

Axles:

Front, 1½ Concord, round centers.

Hind, 1¾ Concord, round centers.

Springs:

Front, 42 x 2¼ x 6 inches.

Hind, 48 x 2½ x 8 inches.

Fifth wheel, 2 feet 6 inches diameter; 1¾ x ½ inch.

Kingbolt, ⅞ inch round.

Pole, 10 feet 4 inches and 3 x 2½ inches.

Upon completion the following scheme for painting is suggested:

Body; black, striped with vermilion. Gear; tan, striped black and yellow; one half inch black stripe with a fine line of yellow each side.

Such a farm wagon can be easily and cheaply built at a good profit by any wagon maker from the directions given.

An Interesting Oregon Shop.

CHARLES WALTER.

The accompanying engraving shows my shop, at Glencoe, the main building being 24 by 60 feet, two stories high, with a one-story addition, 18 by 30 feet. In the shop I have a 42 -inch bellows, a Hay-Budden 150-pound anvil, a Western Chief No. 14 drill, (as good a tool as money can buy), and a shear of my own make, cutting up to $\frac{5}{8}$ by 2 inches, $\frac{1}{2}$ by 3, or $\frac{3}{4}$-inch round. I have a vise on the corner of my forge, and find it very handy for hot rasping as well as upsetting. My emery stand carries two 12-inch wheels. A pump draws water out of a 20-foot well and forces it 44 feet to the 600-gallon tank shown above the shop. I keep the pump going always while drilling and sawing, and in this way have plenty of water for my house (to the left of the shop), for my lawn in summer, and for my horse, cow and customers' horses. A 70-foot hose is ready in case of fire.

My rip saw and planer I made myself. The latter will plane six inches wide, and a 16-inch rip saw will saw lumber and small oak logs up to six inches. I have a Silver 20-inch band saw (made by the Silver Manufacturing Co., Salem, Ohio), and a spoke-tenoning machine which I made out of an old drill. Upstairs I have a wood turning lathe.

EXTERIOR VIEW OF MR. CHARLES WALTER'S SHOP.

To drive my shop I have a $2\frac{1}{2}$ horsepower Weber Jr. engine, with an auto-sparker, which makes a good combination. The engine will start in less than five seconds by giving it from one to three turns. My line shaft is $1\frac{5}{16}$ inches by 30 feet. I have had this engine and these machines just one year, during which time I have used but 100 gallons of gasoline and besides have had all kinds of fun out of it. I would never go back to the old "horse killing" way. If there is any smith who has anything to do besides horseshoeing, I would say to him, buy a similar power outfit and be happy. Do not be afraid of this size of engine; it is plenty large enough for two or three men in the shop. I have no power hammer, but I think they are all right and will put one in soon.

Among my other tools are two blacksmith's and one woodworker's vise, a 4-inch Stoddard tire upsetter, two sets of screw plates, a Little Giant hub-boring machine, which sets the boxes nice and true, a Kinsby Tire Bender that will bend $\frac{3}{8}$ by 3-inch tires, and a Henderson Cold Tire Setter, largest size, in which I have shrunk 4-inch tires without turning the wheel. The wagons in this section have nearly all 3-inch tires and this tool gives the best of satisfaction on strong solid wheels. My shoeing rack is of my own make, and has held at least one mean horse that weighed 1770 pounds.

I also keep all kinds of hand tools, together with a good supply of stock, such as tired wheels, axles, wood stock, hard wood lumber and the like. The upper part of the shop is used for a store room and paint shop. A pair of 6 by 8 trap doors allows me to draw up an entire rig at once.

My business is principally repair work and shoeing. As to a cash or credit basis, I trust nearly everybody and have not lost $20 in the last nine years. In conclusion, I would say to brother smiths, take some good trade paper like THE AMERICAN BLACKSMITH and do the right thing in a business-like way, and you will prosper.

A Model Shoeing and Repairing Shop in Iowa.

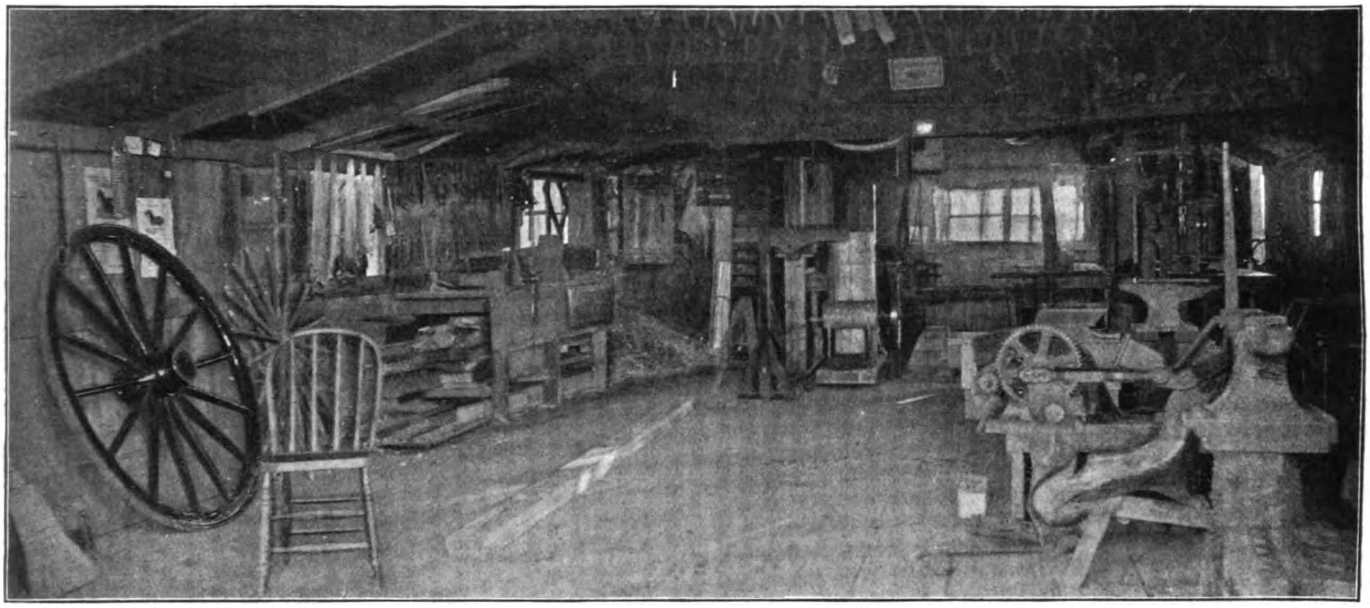
W. H. JOHNSTON.

In my shop, which is 20 by 50 feet, I have a $2\frac{1}{2}$ H. P. Weber Jr. gasoline engine that I have used for two years, and it is a dandy. I have one emery stand that carries two 12-inch wheels, one Champion disc sharpener, one 10-inch cross-cut saw, one 16-inch rip saw, one 10-inch planer and grooving saw attached, one power drill, one mortising machine, one Champion forge with blower attachment, one Peter Wright anvil, one Hay-Budden anvil, clip horn, an 80-pound bench vise, one woodworker's vise, one Greenriver mandrel with 16-inch base, one Eureka tire bender, bending tires up to 5 inches wide, one Little Giant swage block, large size, a full set of top swages up to 12 inches, one Little Giant screw plate with 12 different size dies and two sets of taps, a very nice set, indeed. They can't be beaten for cutting a nice thread. One set of Little Giant pipe dies, one tool grinder, one Mole tire shrinker No. 3, one Easy iron shear, one trip hammer of "any ones" make. It works finely and I will give the description to any brother in the craft, if he wants me to, so that he can make one. I have recently built the trip hammer. The photograph of my shop doesn't show it, as I had the photograph taken last summer. I have a full set of bench tools, both wood and iron working.

I think that a good variety of labor-saving tools is a nice thing in a shop. A mechanic can use them to pretty good advantage in his daily work, and it makes his work easier and better than he can do by the old method, or as the saying is, "A hand saw, a hatchet and a jack-knife." I have heard men say that it was money wasted to buy all the new and improved tools that come along, but if I had a million dollars I would invest it in labor-saving tools and machinery, so that it would do the work, and I would sit on the bench and take in the cash.

In regard to keeping a shop clean, I make a practice of sweeping my shop out every night and dusting off the machinery when I get through work. I wipe off my engine and put the blanket on it to keep off dirt when not in use I also have a place for every tool to hand and when I get through using them I put them in their proper places. I can go in my shop at night without a

lamp and get any tool that I want, for I know where they were last put. It also pleases my customers to see a clean shop and the tools in their proper place. I was out in Nebraska this fall and I visited some of the shops. There was one in particular where a farmer was doing a job himself. The farmer said to the boss, "Where is your cold chisel." The smith turned around a couple of times and said, "I don't know. I have three of four, but it seems to me when I want one I have to hunt an hour for it." He kicked around on the floor among some old scrap iron and finally found it under his feet. The farmer, as he took it, said, "If you would clean out this scrap iron and sell it, take the money to hire someone to sweep out the shop and keep the tools in their proper places, you would save time in hunting for your tools." I couldn't work in a shop where there is so much dirt. Another thing which I think a very good idea, is to have a few good practical books on the subject and to take a good trade journal. I have been a subscriber to THE AMERICAN BLACKSMITH for the past two years, and I am going to continue as long as I can get it.



INTERIOR ARRANGEMENT OF AN IOWA BLACKSMITH AND REPAIR SHOP.

A Treatise On Horseshoeing.—2.

JOHN W. ADAMS, V. M. D.

The Hoof.

With respect to solidity, the different parts of the hoof vary widely. The middle layer of the wall is harder and more tenacious than the sole, for the latter crumbles away or passes off in larger or smaller flakes on its under surface, while no such spontaneous shortening of the wall occurs. The white line and the frog are soft-horn structures, and differ from hard horn in that their horn cells do not, under natural conditions, become hard and hornlike. They are very elastic, absorb moisture rapidly, and as readily dry out and become hard, brittle, and easily fissured. Horn of good quality is fine-grained and tough, while bad horn is coarse-grained, and either mellow and friable or hard and brittle. All horn is a poor conductor of heat, and the harder (dryer) the horn, the more slowly does it transmit extremes of temperature.

Physiological Movements of the Hoof.

A hoof while supporting the body weight has a different form, and the structures inclosed within the hoof have a different position than when not bearing weight. Since the amount of weight borne by a foot is continually changing, and the relations of internal pressure are continuously varying, a foot is, from a physiological viewpoint, never at rest. The most marked changes of form of the hoof occur when the foot bears the greatest weight, namely, at the time of the greatest descent of the fetlock. Briefly, these changes of form are: (1) An expansion or widening of the whole back half of the foot from the coronet to the lower edge of the quarters. This expansion varies between one-fiftieth and one twelfth of an inch. (2) A narrowing of the front half of the foot, measured at the coronet. (3) A sinking of the heels and a flattening of the wings of the sole. These changes are more marked in the half of the foot that bears the greater weight.

The changes of form occur in the following order: When the foot is set to the ground the body-weight is transmitted through the bones and sensitive and horny leaves to the wall. The coffin bone and navicular bone sink a little and rotate backward. At the same time the short pastern sinks backward and downward between the lateral cartilages and presses the perforans tendon upon the plantar cushion. This cushion being compressed from above and being unable to expand downward by reason of the resistance of the ground acting against the horny frog, acts like any other elastic mass and expands toward the sides, pushing before it the yielding lateral cartilages and the wall of the quarters. This expansion of the heels is assisted and increased by the simultaneous flattening and lateral expansion of the resilient horny frog, which crowds the bars apart. Of course, when the lateral cartilages are ossified not only is no expansion of the quarters possible, but frog pressure often leads to painful compression of the plantar cushion and to increase of lameness. Frog pressure is therefore contra-indicated in lameness due to sidebones (ossified cartilages). Under the descent of the coffin bone the horny sole sinks a little; that is, the arch of the sole around the point of the frog, and the wings of the sole become somewhat flattened. All these changes of form are most marked in sound unshod hoofs, because in them ground pressure on the frog and sole is pronounced; they are more marked in fore hoofs than in hind hoofs.

The movement of the different structures within the foot and the changes

of form that occur at every step are indispensable to the health of the hoof, so that these elastic tissues must be kept active by regular exercise, with protection against drying out of the hoof. Long-continued rest in the stable, drying out of the hoof, and shoeing, decrease or alter the physiological movements of the hoof and sometimes lead to foot diseases. Since these movements are complete and spontaneous only in unshod feet, shoeing must be regarded as an evil, albeit a necessary one, and indispensable if we wish to keep horses continuously serviceable on hard artificial roads. However, if in shoeing we bear in mind the structure and functions of the hoof and apply a shoe whose branches have a wide and level bearing surface, so as to interfere as little as may be with the expansion and contraction of the quarters, in so far as this is not hindered by the nails, we need not be apprehensive of trouble, provided the horse has reasonable work and his hoofs proper care.

Growth of the Hoof.

All parts of the hoof grow downward and forward with equal rapidity, the rate of growth being largely dependent upon the amount of blood supplied to the pododerm, or "quick." Abundant and regular exercise, good grooming, moistness and suppleness of the hoof, going barefoot, plenty of good food, and at proper intervals removing the overgrowth of hoof and regulating the bearing surface, by increasing the volume and improving the quality of the blood flowing into the pododerm, favor the rapid growth of horn of good quality; while lack of exercise, dryness of the horn, and excessive length of the hoof hinder growth.

The average rate of growth is about one-third of an inch a month. Hind hoofs grow faster than fore hoofs and unshod ones faster than shod ones. The time required for the horn to grow from the coronet to the ground, though influenced to a slight degree by the precited conditions, varies in proportion to the distance of the coronet from the ground. At the toe, depending on its height, the horn grows down in eleven to thirteen months, at the side wall in six to eight months, and at the heels in three to five months. We can thus estimate with tolerable accuracy the time required for the disappearance of such defects in the hoof as cracks, clefts, etc.

Irregular growth is not infrequent. The almost invariable cause of this is an improper distribution of the body weight over the hoof—that is, an unbalanced foot. Colts running in soft pasture or confined for long periods in the stable are frequently allowed to grow hoofs of excessive length. The long toe becomes "dished"—that is, concave from the coronet to the ground—the long quarters curl forward and inward and often completely cover the frog and lead to contraction of the heels, or the whole hoof bends outward or inward, and a crooked foot, or, even worse, a crooked leg, is the result if the long hoof be allowed to exert its powerful and abnormally directed leverage for but a few months upon young plastic bones and tender and lax articular ligaments. All colts are not foaled with straight legs, but failure to regulate the length and bearing of the hoof may make a straight leg crooked and a crooked leg worse, just as intelligent care during the growing period can greatly improve a congenitally crooked limb. If breeders were more generally cognizant of the power of overgrown and unbalanced hoofs to divert the lower bones of young legs from their proper direction, and, therefore, to cause them to be moved improperly, with loss of speed and often with injury to the limbs, we might hope to see fewer knock-kneed, bow-legged, splay-footed, pigeon-toed, cow-hocked, interfering, and paddling horses.

If in shortening the hoof one side-wall is, from ignorance, left too long or cut down too low with relation to the other, the foot will be unbalanced, and in travelling the long section will touch the ground first and will continue to do so till it has been reduced to its proper level (length) by the increased wear which will take place at this point. While this occurs rapidly in unshod hoofs, the shoe prevents wear of the hoof, though it is itself more rapidly worn away beneath the high (long) side than elsewhere, so that by the time the shoe is worn out the tread of the shoe may be flat. If this mistake be repeated from month to month, the part of the wall left too high will grow more rapidly than the low side whose pododerm is relatively anemic as a result of the greater weight falling into this half of the hoof, and the ultimate result will be a "wry," or crooked foot.

Care of Unshod Hoofs.

The colt should have abundant exercise on dry ground. The hoofs will then wear gradually and it will only be necessary from time to time to regulate any uneven wear with the rasp and to round off the sharp edge about the toe in order to prevent breaking away of the wall.

Colts in the stable can not wear down their hoofs, so that every four to six weeks they should be rasped down and the lower edge of the wall well rounded to prevent chipping. The soles and

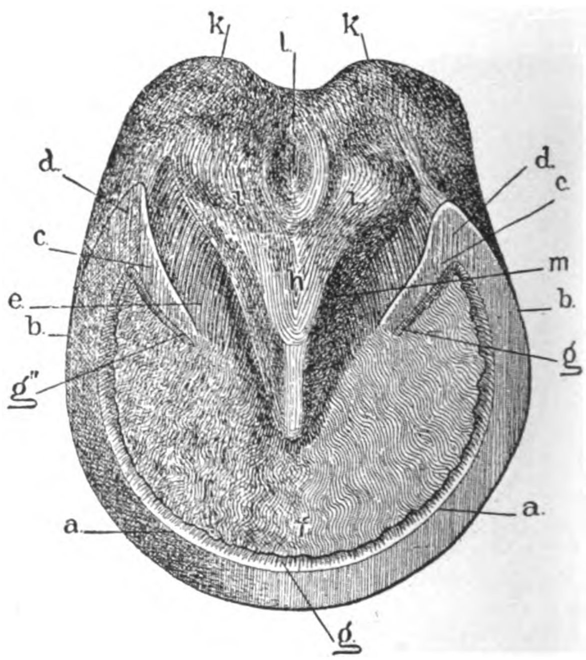


Fig. 1. GROUND SURFACE OF A RIGHT FORE HOOF OF THE REGULAR FORM: *a*, *a*, WALL; *a-a*, THE TOE; *a-b*, THE SIDE WALLS; *b-d*, THE QUARTERS; *c*, *c*, THE BARS; *d*, *d*, THE BUTTRESSES; *e*, LATERAL CLEFT OF THE FROG; *f*, BODY OF THE SOLE; *g*, *g'*, *g"*, LEAFY LAYER (WHITE LINE) OF THE TOE AND BARS; *h*, BODY OF THE FROG; *i*, *i*, BRANCHES OF THE FROG; *k*, *k*, HORNY BULBS OF THE HEELS; *l*, MIDDLE CLEFT OF THE FROG.

clefts of the frog should be picked out every few days and the entire hoof washed clean. Plenty of clean straw litter should be provided. Hoofs that are becoming "awry" should have the wall shortened in such a manner as to straighten the foot-axis. This will ultimately produce a good hoof and will improve the position of the limb.

Characteristics of a Healthy Hoof.

A healthy hoof (Fig. 1) is equally warm at all parts, and is not tender under pressure with the hands or moderate compression with pincers. The coronet is soft and elastic at all points and does not project beyond the surface of the wall. The wall is straight from coronet to ground, so that a straight-edge laid against the wall

from coronet to ground parallel to the direction of the horn tubes will touch at every point. The wall should be covered with the outer varnish-like layer (periople) and should show no cracks or clefts. Every hoof shows "ring-formation," but the rings should not be strongly marked and should always run parallel to the coronary band. Strongly marked ring-formation over the entire wall is an evidence of a weak hoof, but when limited to a part of the wall is evidence of previous local inflammation. The bulbs of the heels should be full, rounded, and of equal height. The sole (Fig. 1) should be well hollowed out, the white line solid, the frog well developed, the middle cleft of the frog broad and shallow, the spaces between the bars and the frog wide and shallow, the bars straight from the buttresses toward the point of the frog, and the buttresses themselves so far apart as not to press against the branches of the frog. A hoof cannot be considered healthy if it presents reddish discolored horn, cracks in the wall, white line, bars or frog, thrush of the frog, contraction or displacement of the heels. The lateral cartilages should yield readily to finger pressure.

Various Forms of Hoofs.

As among a thousand human faces no two are alike, so among an equal number of horses no two have hoofs exactly alike. A little study of different forms soon shows us, however, that the form of every hoof is dependent in great measure on the direction of the two pastern bones as viewed from in front or behind, or from one side; and that all hoofs fall into three classes when we view them from in front and three classes when we observe them in profile. Inasmuch as the form of every foot determines the peculiarities of the shoe that is best adapted to it, no one who is ignorant of, or who disregards the natural form of, a hoof, can hope to understand physiological shoeing.

(*To be continued.*)

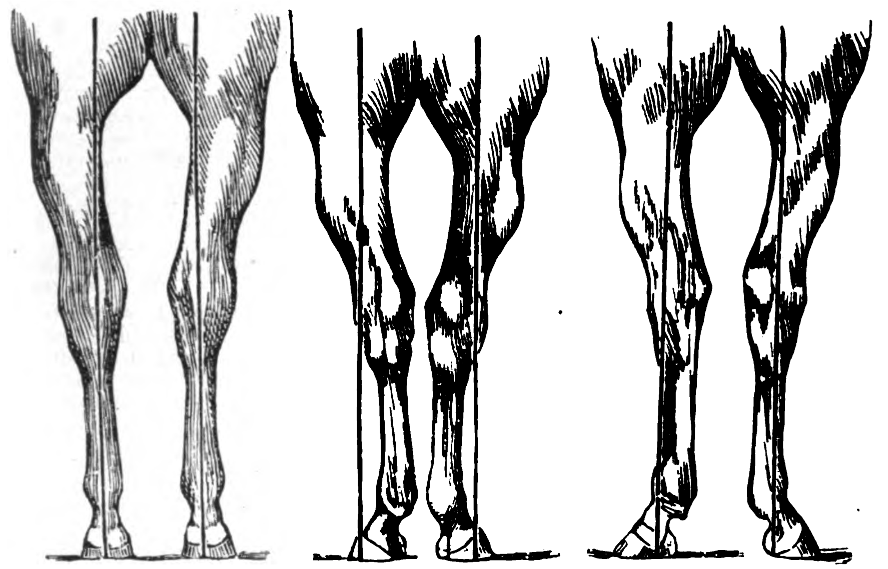


Fig. 9. *a*, REGULAR CONFORMATION; *b*, TOE WIDE AND TOO CLOSE BEHIND; *c*, LEGS BADLY TWISTED.

The Practical Scientific Treatment of Interfering Horses.—4.

E. W. PERRIN.

Interfering Hind or Fetlock Striking.

Ankle hitting, or fetlock striking, consists in the animal striking the inside of the fetlock with the hoof or shoe of the opposite foot. The concussion resulting from the blow often causes the animal to go on three legs to carry the limb for a few steps, like a lame dog. In some cases the point of contact is between the inside toe of one foot and the coronet of the other, that is, they strike the coronet instead of the fetlock.

Fetlock striking behind is very common; all shoers have to contend with it, and every shoer of experience occasionally meets with cases that are very difficult to cure, for, notwithstanding the fact that interfering is so common, it involves scientific principles that are not generally understood by the average horseshoer. Hence the large number of horses wearing boots that would be unnecessary in most cases if the cause of the trouble were clearly understood.

Causes.

The most prolific cause of fetlock striking behind is defective conformation of the limbs, weakness, poor condition, improper hitching, or reckless riding or driving. Sometimes a horse will interfere as a result of a spavin or curb in the hock, or any pain in the foot or limb which interferes with the animal having proper control of the affected limb may cause interfering. Improper shoeing is also a cause.

Treatment.

Two old anvil ringers were talking interfering; one said to the other, "What's the best shoe for interfering?" "Why, that shoe which stops him interfering," was the curt reply. Just so, but the kind of shoe, the method of applying it and preparing the hoof, will vary according to the circumstances of each particular case, so that we cannot intelligently apply the remedy until we have ascertained the cause. If a horse interferes because of being over-worked, don't try to remedy the trouble by shoeing, but protect the injured part with properly fitting boots. Maybe it is a young horse not yet settled down to his work. If the horse be in good condition, and the shoeing apparently correct, then look for defective conformation of the limbs. Fig. 9, A shows the regular conformation; such animals invariably go clear, because the hind feet move straight forward in line with the front ones. You can't make such a horse interfere unless he goes side-ways from improper hitching or loses control of his limbs from being over-driven, etc. Fig. 9, B shows a horse too close behind and toe-wide. Horses of this conformation are very liable to cut their ankles. Fig. 9, C shows a case with legs badly twisted. This form is also very prone to fetlock striking. Now, the mode of preparing the hoof and the shoe to be used will depend on the mode of going and the point of contact in each case. To look at these drawings one would think that such horses would "break-over" at the inside toe, that is, that the inside toe would be the last to leave the ground, but this depends largely on the motion of the body; as you sit behind such horses in the buggy, you'll invariably see the hind quarters roll from side to side. Now look down at the hind feet only, and notwithstanding the fact that the toes are turned out the feet will invariably "break-over" on the outside toe or quarter. In some cases the foot gives a twist at each step just on the point of leaving the ground, and ninety per cent. of such cases are outside wearers, that is, they wear harder on the outside of the shoe than the inside. Now as to the point of contact. The inside of the hoof will generally be marked with a blood spot from the injured fetlock. If, however, you are in doubt as to the part of the hoof with

which he strikes, chalk the inside of the hoof he strikes with, put some axle grease or black paint on the fetlock, drive the horse on a dry road, and as soon as he hits stop and examine the foot; the black paint will indicate the point of contact. If the horse strikes with the inside toe, then use shoe at D, Fig. 10, fitted close between X and Y. Rasp away a little of the wall at that part. If the point of contact is at the quarter, use shoe of Fig. 10, E. If the point of contact is just at the inside heel hole, as it is in sixty per cent. of the cases, and wearing heavy on the outside of the shoe, then lower the outside of the hoof, and use the shoe of Fig. 10, F. Fit close at the point of contact, but full at the inside toe, and roll the outside quarter between A and B. If your horse is of the conformation in Fig. 9, C, and wearing level, then shoe with a spur on the outside heel of the shoe with a light inside fitted close at the point of contact. In all cases don't use more iron than is compatible with a reasonable amount of wear, because to burden the limbs with extra weight tires the muscles and thus aggravates the trouble.

(To be continued.)

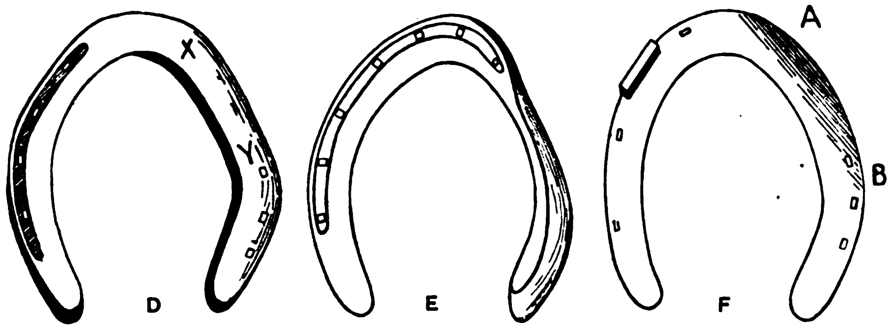


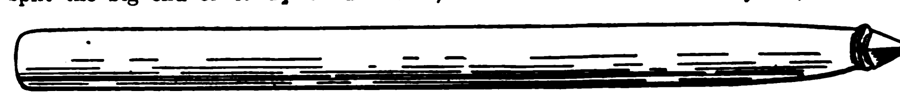
Fig. 10. TYPES OF SHOES TO CORRECT VARIOUS PHASES OF INTERFERING.

Drawing Out a Neverslip Calk.

L. E. BUSH.

The ice on the roads in this neighborhood was so thin and hard that it was next to impossible for a horse to get a hold. The thought of drawing out the Neverslip calk occurred to me and I immediately tried the experiment. It proved successful and I thought perhaps some brother smith could profit by it. I first took a piece of iron about 18 inches long and drilled a hole in the end. Next I cut threads in the hole with my Neverslip tap and I had a fine tool for holding calk while sharpening.

This may be published too late to be of value to any horseshoer this winter, but they may remember it to advantage some other time when a very cold snap makes the roads like glass. It certainly proved a kink of the greatest use to me during the past winter.



TOOL FOR HANDILY DRAWING OUT NEVERSLIP CALKS.

Queries Answers Notes

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Butcher Knives.—I would like to know the proper way of tempering butcher knives so as not to warp. SAMUEL KREBS.

Dividers and Butcher Knives.—I would like to have some one of the craft tell me the best way to make a pair of dividers or compasses. Also how to temper butcher knives in water, so as not to warp. I have had trouble with them. THOS. LONG.

A Bar Shoe.—Take a Burden snow shoe weld a toe calk on the toe, make a nice frog pan, drill holes smaller than calk, tap out with taper, and then insert Neverslip calks, which makes a neat shoe, and takes the jar from the heel. Finish as good as you possibly can to draw trade. BYRON WALLACE.

Interfering.—I have a horse that interferes so badly with his hind feet that his ankles are bloody all the time. I have shod him every way that I know of, but he still strikes. I have had him raised on the inside extra high. If some one could give me a pointer on him it will be appreciated. The horse is in good shape and interfered before he ever had a shoe on. BERT FIELDS.

Plan for Taking Out Buggy Bolts.—The following is my plan for taking out bolts from a wagon or buggy wheel, and I think it is a good one. First remove the nuts, then drive the bolts out, or start with the hammer. Next take a sixteen-inch file, split the big end of it 1½ or 2 inches, shaping the end like a claw hammer. Place the fork over the bolt between the bolt head and tire. Striking with hammer, the bolt is easily removed. W. M. TANNER.

Shoe for Narrow Feet.—Mr. C. W. Metcalf, in the January number, gives a shoe of new design for narrow feet. I will say that I have used the same shoe this winter with very good results. The horse had been shod by a man that said that there was a bone loose in the coffin joint. I saw that the foot was badly contracted, took off the bar shoe, used a shoe like the one mentioned above and the horse is getting better. I believe it can be highly recommended for use on contracted feet. H. NOTESTINE.

A Letter from New Jersey.—I have been a subscriber since your first issue. I think the paper is worth many times the price to any blacksmith if he is not the know-it-all kind. I have a Standard cold tire setter, a Western Chief drill of the largest size, a Green River vise, a set of improved Lightning dies, a No. 400 Champion blower and am sending an order for a 3 H. P. Witte gasoline engine with this mail, so you see I read the ads. as well. I appreciate your efforts to improve your paper; it is with you the same as it is with us, always looking up and trying for something better. So much for this time. G. I. NELSON.

Louisiana Prices.—

Horseshoeing, new shoes	$ 1.50
Shoeing, resetting	1.00
Toe Calks and heels	2.00
Setting buggy tires	3.00
Setting wagon tires	4.00
Setting axles	1.50
Setting 4-inch tires, per pair	5.00
Buggy shafts	1.50
Singletrees	.75
Filling buggy wheels	3.50
Sharpening plows	.25
Painting old buggies	15.00 and up

J. V. CAFFAREL.

A Lien Law Letter.—In regard to the Lien Law, it is a good thing to do something to protect the hard laboring blacksmith. I have been in business for twenty-four years, and I have learnt by experience that there are a great many dead beats in this world. They come into a shop and get some work done and haven't any idea of ever paying for it. They will tell you a good story and put on a good face for the time being, and then you can whistle for your pay. If we had a Lien Law, so that we could put a lien on our work, it would be a very good thing for the blacksmiths. I am in favor of a Lien Law. H. L. OLMSTED.

Flue Welding.—Being obliged to do quite a lot of welding safe ends to boiler tubes, we occasionally experience trouble in not being able even with the best of fire and care to get a good weld. In the best heat they refuse to catch. We chamfer all flues on lathe so as to have a good fit. The larger sizes are worse than the smaller ones. We have resorted to all kinds of remedies, but to no avail. Sometimes changing to another kind of tube will help out to some extent, which would indicate that the grade or quality of the tube had something to do with it, yet we would not claim either that the same is entirely the fault. We have used different welding sands and compounds, but to no avail. We should like very much to hear from others who have had experience in this line. Have been in the business about twelve or fourteen years, but have not found a good remedy yet. It is often a long time between such cases, as they are rare. A discussion of this matter will be followed with great interest by J. M. K.

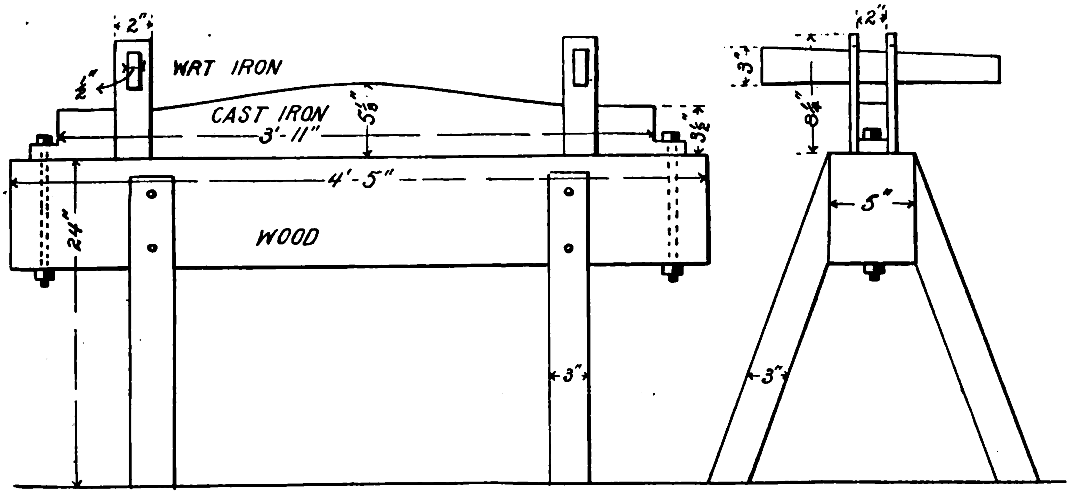
A Paying Side Line.—The recent item in "Queries, Answers, Notes" column by W. C. Powell has interested me very much. I will give my brother craftsmen my experience along the same line. Two years ago I started to carry a line of farm implements. I had saved about $200 and wanted it to make something more than a common 6% interest, so I started with the side line. I first built a lean-to on one side of my shop, 12 by 24, and stocked it as follows: One buggy, mower, rake, disc harrow and a few minor things. In three months I had to put another lean-to on the other side, and put in a wagon and other small implements for farmers, such as plows, etc. Last spring I built a corrugated iron building 25 by 40 and stocked it, but my sales increased so rapidly that in the fall I was compelled to extend it to 25 by 80. I find on going over last year's books that I have done about $9,000 worth of business, on which I received spot cash discounts amounting last year to $175. By allowing it to go until it became due, which would be from sixty days to six months, I would have lost, so brother tradesman, you will see the advantage of paying cash. The line of goods I now carry is wagons, ploughs, harrows, etc., nails, barb wire, smooth wire, forks, shovels, plough repairs for leading ploughs, or in fact anything I do not carry in stock I will procure for my customers in the shortest time possible. Among my sales for last year were 21 wagons, 16 buggies, 30 ploughs, 11 mowing machines, 9 rakes, 16 one-horse cultivators and this year I hope to increase my sales. This in addition to running shop with the help of one man. CHAS. STONEHOUSE.

Axle Tools.—The Gather of Axles.—The following, in reply to Mr. Blanchard and Mr. Foster in the February issue, may be of interest: I enclose draft, giving the exact dimensions of an axle form and gauge for axles, with 1½-inch drop, and 4 ft. 8-inch track. The sizes of axles shaped over this form vary from 1⅛ inch to 1⅞ inches. Of course a man can construct a form to suit his own work, according to shape and size of axles he wishes to use it for. The gauge is a very simple arrangement, made out of a piece of ½ by ¼-inch tire steel, and it is not particular whether it be made like draft or not. Some smiths use gauges with the hook on one end only, and a mark for length on the other.

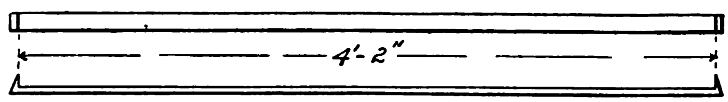
In regard to the smith, who says he differed with me on setting axles so as to give no gather to the wheels, I'll say that I will send an answer to this soon. This is a question on which I am aware that smiths differ considerably, and it will need considerable explanation on some illustrations. In the meantime, and if it would be satisfactory to THE AMERICAN BLACKSMITH and the gentleman referred to, I would like to arrange for a debate with the brother smith on this subject, on the condition that we both write out our views, to be published in the same issue, so that one won't have the advantage of having read the other's position before he writes.

NELS PETERSON.

[NOTE.—A discussion of points at issue like this is always an excellent way of bringing out the best methods and getting down its correct principles. A practical discussion of any statements made in these columns will always be welcome.—*Ed.*]



FORM FOR SHAPING AXLES.



AXLE GAUGE.

Removing Paint.—I would like to know the best way to remove paint from an old vehicle. I have a great deal of this work to do and find the use of pumice stone too slow. Will some brother smith tell me a quicker method? J. V. CAFFAREL.

In Reply.—"The best process of taking off old paint from an old vehicle" is to burn the paint off. I say "best" advisedly, because while even quicker methods are advertised, the burning off, if skilfully performed, leaves the wood in a perfectly sound and normal condition to again paint over. There are a score or more paint and varnish removers on the market recommended to act upon the paint so powerfully that it is only necessary, after applying the remover, to wash it off with a sponge and water.

These removers are composed of very active and penetrating ingredients and their action upon the wood is not always negative, and not infrequently quite the reverse, in which case, of course, the paint structure built over the wood so deleteriously acted upon cannot be guaranteed to long hold in place. Burning the paint from the wood is a quick, effective and trustworthy method of cleaning and preparing the old surface for repainting. Hold the flame on the paint just long enough to soften it up and then with a broad blade putty knife, held at an angle of 45 degrees, lift the softened pigment from the wood. For burning off paint in a small shop use a first class brasier lamp or torch, costing about $5. It should carry an 18-gauge seamless brass tank of 1 quart capacity. Have it made with a heavy burner and constructed on the patented coil system to retain heat to the maximum limit. It should be adjusted to work in any wind perfectly, and to produce heat to about 2,000° F. The lamp weighing 4½ lbs. and burning 74° gasoline will probably meet our correspondents' requirements fully. Such a lamp, or information concerning all kinds of gasoline lamps, may be obtained from the Turner Brass Works, No. 63 N. Franklin St., Chicago, Ill., whose advertisement appears in the AMERICAN BLACKSMITH. M. C. HILLICK.

A Large Engine Casting.—The base of the largest gas engine of its kind ever manufactured was recently cast at the foundry of the Weber Gas Engine Company in Kansas City. Eight tons of molten iron were necessary to fill the mold.

The engine is a vertical two-cylinder one, having a capacity of 150 horse-power. The fly wheel is 72 inches in diameter. Most gasoline engines range from two and one-half to twenty-five horse-power. This engine is being built for the World's Fair, and the company has received orders for several large ones in addition.

The engine cast will occupy a space of thirty by fifty feet at St. Louis. It will be equipped with a gas producer, also a Weber patent, on its right side, and on its left side will be placed a generator. With charcoal as the only fuel used, gas will be produced, fed to the engine and with the power produced, electricity will be generated. The engine itself will occupy a space only six by ten feet and stand about twelve feet high. It will weigh sixteen tons.

In making a casting many preliminary steps are necessary. Workmen had been busy for a week preparing the mold for the big base cast.

First, a large pit was dug in the sandy loam which comprises the only floor of the foundry. The bottom of this pit was covered for a foot with a lining of coke. The pattern or model was placed in the pit and pipes laid to the surface from all four sides, to be used as an outlet for the escaping gases. The entire was then covered with a mixture of loam and sand. The coke underneath was ignited and the loam and sand on all sides of the model was baked hard. This baking process continued for several days. On three sides, cup-like apertures remained, into which was poured at the proper time the molten metal.

To hold the molten metal for the big casting three large ladles were used. Each had a capacity of from three to five tons. They were swung on cranes or derricks. As fast as a ladle was filled it was hoisted and carried by the crane to a position in front of the cup-like apertures of the impression where the casting was to be made. When all three had been placed in position, the metal was poured into the three ladle apertures, simultaneously.

As the three streams of molted iron

poured out, the escaping gas ignited, the woodwork caught fire, the entire top of the molding was aflame and the entire foundry was enveloped with steam. The foreman cried "Enough," and the ladles were tipped back, the fires were put out and men with long iron pokers forced the now cooling iron into every portion of the impression.

A Few Words on Organization.—I would like to write a few lines regarding blacksmith organizations. It is a question which I have both studied and consulted my brother craftsmen on. There is one thing which I would like to see the blacksmiths and wagonmakers in every State do, and that is to have their own wholesale

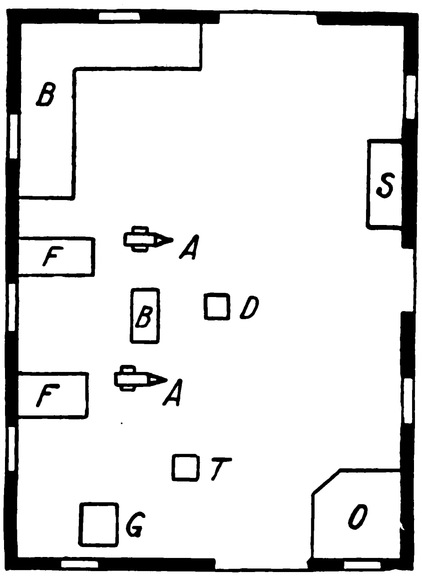


Fig. 1. LAYOUT OF A TWO-FIRE SHOP.

house in some large city or cities and form a regular corporation and each smith have a share or more. This would give them a foundation to start with. There are farmer stores and elevators which are the best paying investment in the land today. In a great many parts of the country blacksmiths have united to increase and protect prices, but in every case, as I believe, we have not commenced at the business end. I trust that the blacksmith, horseshoer, and wagonmakers' associations will take this up and organize a stock company and control our own wholesale houses. Brother blacksmiths, give this a thought. It seems to be a big proposition, but it could be done easily. It is like building a wheel. We must have the hub to commence with, for it is the foundation. At the end of the spokes is where the trouble is found. When it gets old it is there that it commences to fall to pieces. J. H. BUTLER.

How One Young Smith Made a Start.—Being interested in the blacksmithing and thinking over how I started, I imagined it would be of interest to some beginner to write an article on how I got ahead. I was born in 1883 and commenced work when not quite thirteen years of age. I first became interested in blacksmithing when very small. I used to go to town with my father, and if I could get a chance, would go and watch the men work at the smith shop and would think, that is what I want to do when I am a man. When I was about twelve years old my father had a room in which he did small tinkering jobs for himself. He used an old stove to heat his iron, and had an old flat iron settled into a block to hammer and cut out anything on. My father once told me to make a blade for a broken penknife. I cut out a blade from an old saw and filed it down, and finally it so happened that I got a temper that would carry a good edge. My father, seeing that I wanted to learn, purchased an old bellows that had been thrown away by the user as being no good. We patched and set it up in an old farm house. For my anvil I had an old piece of cast iron out of an old mill. Lucky for me, I welded the first piece of iron. I have the piece today.

Now I began to do my father's work, such as mending chains, single-trees, etc. Then some of the neighbors gave me work to do. My aim was to do it as strongly and neatly as possible, but it was quite a job for me, as I had never worked a day under another smith in my life. After I had worked awhile, I built a new shop 14 by 14 feet, and also made myself a new bellows. Later I built on to this shop and then began to work for the farmers and oystermen. When I was fifteen, I could make a pair of oyster tongs that would pass with the best of oystermen. In the oyster season I would make as high as fifteen dollars a week, this surprising the people. I began to get more work all the time and to hire help in busy seasons. When I was eighteen my father gave me full control of my shop and the following year I had to hire a second helper. In 1902 I built a new shop 25 by 40 feet and two stories high, taking the old shop to store material. From the beginning, whenever I could, I would add new tools and now I have a steel blower and one bellows, but intend to buy another blower as it will pay for itself. I have a Champion tire shrinker, and a set of wood working tools. I have no engine, but I intend to put one in soon

Fig. 1 shows the plan of my shop. My work in the winter is principally horseshoeing; in spring, plow work and new wagons, carts, etc. In summer I do general repairing and painting carriages, and in the fall, repairing, and making oyster and claming tongs. There is some horseshoeing all of the year, but most of it in the winter.

But how had I learned to do all kinds of work, such as building new wagons, horseshoeing, carriage painting and tempering steel? I learned it by the use of books and THE AMERICAN BLACKSMITH. For example, when I began to repair and build wagons and carts, I did not know any rule for setting axles, but it happened about that time that I got a copy of THE AMERICAN BLACKSMITH, and sure enough, there was a rule in it to set axles. I have been setting axles by that rule ever since. When I began horseshoeing I knew how to rest the foot and nail the shoe on, but it troubled me to know how I was to shoe the interfering and forging horse, the contracted hoof and the stumbler. When I got acquainted with THE AMERICAN BLACKSMITH I found out how to do it. With a little practice I could do good shoeing and give satisfaction. When I started to paint carriages, the first one showed it was no easy matter, so I began to read the articles of Mr. M. C. Hillick, and also asked several questions on painting, which were answered through THE AMERICAN BLACKSMITH. I really think that contributors of THE AMERICAN BLACKSMITH are the best authorities, for they seem to commence at the root and go up to the top of the tree, not skimming, but telling the cause and then the cure of what they write on.

Perhaps a few words about the business will not be amiss. First I will say, find out all you can about your customers and also the ones that may be your customers. Otherwise when a new customer asks you to extend one credit to him, you may be the loser or if you refuse him you may lose a good customer. Hence, I think it best to know before he comes. Should you extend him credit, try and find out in a sly way how long he wants credit for. I go at him in this manner: "I am glad to extend credit to you and thank you for your work. Can you make it convenient to pay this the first of next month, as I shall have a special use for the money at that time?" Aim to get a promise of when he intends to pay the debt and mark it down on your book. Should he want a new wagon on time, I talk like this: "I would be glad to give you time on the wagon if I could, but owing to the low price and the use I have for the money at this time I shall have to ask for the cash. Now if you could give me a note so I could get the money on it, then I can fix you up." If I wish to refuse him entirely, I talk to him as politely as I can and say something like this. "I would like to give you the time on your work, but my expenses are so great and I work so cheap, that I will have to ask you for the cash, as you see that I have to pay my workmen cash and pay cash for my material." Do not offend him and he will come the next time and bring the cash, whereas if you offend him he will go somewhere else and run down your work, no matter how good it may be.

As an aid to keeping your business straight I find that cards like Fig. 2 will prove good where you have several workmen. When you give a workman a job, let him take the time when he commences and when he stops; also the material. The figure shows one of the cards filled out. When he completes the job let him hand the card in. From it you can figure what the job costs, whereas if you do not know the time you may charge too much or not enough. At the end of the week take all the cards and figure up what you have made that week, what material you have

Jan. 25, '04.

Name......*James Morgan*..............................

Article....... *Wagon* ....

Started .... *9 o'clock*........ Stopped....*11:30*..........

Material........*5 Spokes 1½*...... *1 New Shaft*.....

......*2 New Bolts ⅜x2½*........*7 Bolts 2x¼*.....

By................. *Irving Hayley*..............................

Paid?....*No*..........

Fig. 2. CARD FOR KEEPING TRACK OF WORK.

used and what workman has earned the most for you. The cards are also a record of which jobs are paid, and from them you can give your customer an itemized statement of account. They like it this way, for when a bill runs up fast and you just give the whole amount, your customer may think that there is a mistake in it.

I hope that what I have written may be of some use to the craft. For myself I have just begun to learn and I think it good to get ideas from others. C. D. BRIDDELL.

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Seekers After Information.

If there is any question about blacksmithing, horseshoeing or wagon work that you wish to ask, any problem that is bothering you, do not hesitate to see if THE AMERICAN BLACKSMITH can help you. It is our aim to aid the craft in general and our readers in particular, in every way that we can; hence we wish them to feel free to call upon us at all times. If it should so happen that the question cannot be answered from our own practical experience, we will probably be able to get an opinion from some craftsman whose work has been along the line in question. At any rate, there is everything to gain and nothing to lose by sending your questions to THE AMERICAN BLACKSMITH.

The Prize Article Contest on Gas or Gasoline Engines.

Regarding the recent prizes offered for the best articles on the advantages of gas engines for blacksmiths, one of our readers has asked if gasoline engines were included. Inasmuch as the large proportion of such engines in small shops use gasoline, they are of course meant to be included in the topic. The term " gas engine" was used as referring to the whole class of explosive engines as distinguished from steam engines.

So much interest has been shown in the subject that the date of closing the contest has been extended to May 5th. One first prize of ten dollars, two second prizes of five dollars, and three third prizes of yearly subscriptions to THE AMERICAN BLACKSMITH will be awarded to the six best articles on the advantages of gas or gasoline engines for smith shops. The articles should not be more than about 1000 words in length. Those of our readers who desire to write an article in this contest still have time, therefore, in which to send it.

New Shop Tools.

No manufacturing business is ever very successful that does not keep its tools and equipment up to date. The reason for this is a matter of competition. The shop which has tools to do a given job quicker or cheaper than another, can afford to sell their goods cheaper and thus command the trade. One maker succeeds where another fails, or even one country prospers where another is poor, because progressive manufacturers are continually keeping their shops up to date. In large shops, a fund is constantly set aside to take care of depreciation of equipment and to provide new tools, not when the latter are worn out, but when an improved tool can be had.

So also in smaller shops. Blacksmiths and wagon makers should always figure on devoting a portion of their earnings toward improving their means of turning out work rapidly and at the least cost of production. There is no doubt about its paying. We do not advise the purchase of every new tool as soon as it comes out. Rather should the smith investigate. Let him write to the manufacturer for a catalogue and particulars about any tool that seems to offer an improvement on his shop method, or let him ask to see it at his dealers. If satisfied that the implement can do some of his work better, quicker or more cheaply, he can rest assured that it will pay him to buy.

The Railroad Master Blacksmiths' Convention.

On behalf of his Association, President George Lindsay, of the National Railroad Master Blacksmiths, is extending to all members and master blacksmiths a most cordial invitation to attend the next annual meeting of the Association, which will be held in the city of Indianapolis, Ind., August 16, 17 and 18, 1904. This meeting will be of exceptional interest, as a number of prominent railroad officials are expected to be present. The committees who have in charge the various subjects to be brought before this meeting are making every effort to ensure thorough and exhaustive reports on the subjects assigned them. A profitable time is promised all who will attend.

The Blacksmith Apprentice.

Following the inevitable law of supply and demand, the price paid for the services of competent blacksmiths will undoubtedly increase during the next decade. As nearly as can be judged from an extensive correspondence with the craft in various sections, there seems to be a great and growing scarcity of apprentices, which means a future scarcity of smiths, and hence an increase in the price which must be paid to obtain their services. We are far from bewailing this fact in itself, for there are few blacksmiths today whose labor brings them as great a return as it should, comparing them with other mechanics and artisans in other crafts requiring equal skill and effort. We do regret the tendency, however, of young men who are choosing a trade, to look down upon blacksmithing as something beneath them. Let him who is afraid to soil his hands, remember that the grime of any honest toil is a badge of manliness in itself; let him who thinks blacksmithing a grade beneath him bear in mind that the smith is the leading man in many communities; let him who

believes that once a blacksmith he can never amount to much, recall that from the forge workers' ranks have come some of our foremost thinkers—it is the man and not the trade that counts.

We had not intended to "sermonize," but the topic is important. Every blacksmith takes a pride in his craft, a craft which has existed from the earliest times, and upon which a host of other trades depend. But it is not enough for a smith to take pride simply in his ancient craft. He should use his influence towards its betterment, and in no way can he do it a greater service than by having an eye open as to its future. Strive to convince "likely" young fellows of the opening which blacksmithing offers for good men; induce them to take it up for their livelihood, and encourage them in an endeavor to become good smiths.

A Handsome Ornamental Iron Grille.

The photograph shown herewith is that of an ornamental grille recently made by the Ornamental Iron Works, of Washington, D. C., for the new residence of Mr. James Green, one of Washington's millionaires, on Massachusetts Avenue, between 17th and 18th streets. The grille is eighteen inches wide, seven feet high, and is entirely hand wrought iron work.

It is a splendid specimen of work of this nature well worth reproducing.

HANDSOME ORNAMENTAL GRILLE OF WROUGHT IRON.

Talks to the Jobbing Shop Painter.—13.

The Utility of Varnish Colors.—Yellow Color-and-Varnish.—The Blues.—The Greens.—The Lakes.—The Browns. —Miscellaneous Colors.—Peculiarities and Methods of Handling.

M. C. HILLICK.

In writing these talks from month to month to the jobbing shop painters, a multitude of whom are readers of The American Blacksmith, the difficulty is not in a scarcity of material, but in deciding what is of the most vital concern to the painter—what is essentially a part of his every-day experience, and upon which he must act promptly. Just at the present time, no doubt, he is deep in all the intricate and amazing mysteries of color combinations, color effects and the best methods of handling colors, etc. It is in order, therefore, and quite appropriate to the season, to turn to the utility of varnish colors.

In city shops, and, indeed, in all up-to-date shops, the advantage of using varnish color, where it can be used, in preference to flat color, is clearly recognized and conceded. A color mixed to dry "flat" or "dead"—interchangeable terms in use among a majority of painters—offers a maximum density or opaqueness, whereas the color and varnish—or glazing coats, which virtually represent color and varnish—offer a minimum density or opaqueness.

When the "flat" or "dead" color coat is varnished, the lustre or brilliancy is upon the surface, but when the color-and-varnish, or the glaze coat is varnished the lustre and brilliancy has a depth and body to it, which arouses admiration. In other words, the varnish-color coat has a depth of lustre and a sharp clearness or brilliancy down into which the observer may look as one would look into a well to find his countenance mirrored on the face of the water. As an experienced carriage painter puts it: You look into the flat color coat as you would look into a stone wall, and into the color-and-varnish coat—the real Simon pure color-and-varnish—as you would look into the mirror. The color-and-varnish has a power for reflection which the flat color does not possess.

Yellow Color-and-Varnish.

Perhaps no color is so susceptible to the effects of varnish, when the varnish is thoroughly united with it, as the big and beauteous family of yellows. Take, for example, Primrose yellow, Fashion's favorite, and originally English. To obtain the smart effect which has given this color an international reputation, bring the foundation up from a pure white priming coat, gradually deepening the surfacing coats until the real Primrose is reached. Then use enough of the color to stoutly stain the varnish in which it is used, and apply the mixture with a bristle or badger hair varnish brush, flowing the color-and-varnish on freely in order to give it a richness of body it will not possess when applied in a thin, brushy film. Such a Primrose yellow will show a measure of brilliancy, a beauty of color tone, which a life-time of the flat color could not equal, or, in fact, approach. The same is true of sulphur yellow, canary yellow, straw color, lemon chrome yellow, cream color—in short, true of all the yellow from the least to the greatest.

The Reds.

Carmine, the queen of the reds, could not long maintain the blush of beauty that has made it famous throughout the world if it were used otherwise than as a color-and-varnish over a ground color almost as rich and fine as itself. In the same category we might mention French red, Manhattan red, Crimson, Maroon, Cherry, Carnation, Claret, Coach painters' 20th Century, and a great company of other dashing reds all depending for their most engaging display of charm upon their use as glazing colors, or as color-and-varnish. Make the foundations fine and dense as to color, free from all defects, and then when the shade of the color that is to be has been duplicated as closely as a flat color will duplicate it, mix just enough of the red in varnish to stain the

varnish and enrich the ground color, and apply as freely as one would apply the clear varnish.

The Blues.

A dainty and delicate family of pigments are the blues, chief among which, for carriage painting purposes, is the lovely ultramarine blue, furnished in three shades and pretty enough to win a King's ransom. For this color make the ground of flat black. Float the blue in elastic rubbing varnish, using sufficient pigment to furnish a rich blue without dulling the brilliancy of the varnish. If necessary, in order to get the desired density of color without detracting from its brilliancy, apply two coats of the ultramarine glazing, flatting the first coat out with a moist sponge dipped into a little pumice stone flour. Prussian blue, declared by many to be the belle of the blue family, and certainly a magnificent blue when used upon some surface, is seen at its best when used as a color-and-varnish over a ground brought up to approximate it in tone and color. Perhaps the most elegant blue extant is obtained by glazing ultramarine blue over a ground of deep green.

The Greens.

The big and splendid family of greens comprise such favorites as Brewster—a name to conjure with!—Quaker, Bronze, Olive, Merrimac, Newark, Murphy, Milori, Coach painters' green, and many others, most of which are enriched and beautified under the magic flow of varnish, when mixed and applied with it as glaze colors.

The greens, on the whole, require very perfect grounds; and most greens cannot be cross-brushed at the end of the panel without showing a different shade of the same color. This is a marked peculiarity of nearly all greens, and enforces the importance of handling the colors with due regard to this characteristic.

The Lakes.

The lakes are largely used as running parts colors; and comprise such famous colors as Chatemuc, Munich, Carriage part and Carmine lake, and Carmine—also technically a lake, and the loveliest one of the lot—together with English purple, and yellow lake, and American and English crimson lake, all of which are, or should be, used as varnish colors or glazing colors.

The ground colors for all these lakes, and they are a very delicate and sensitive aggregation, and very beautiful withal, should be brought up absolutely without spot or blemish, and to a close match with the particular lake to be used. The lakes are very transparent, and deficient in coloring or covering power, hence the indispensable need of perfecting a ground without flaw, and very close to the shade of the lake. In fact, the true mission of the lake is to simply enrich the ground color upon which it is placed.

In attempting to make the lake cover defects in the ground color, the painter fails in securing what the manufacturer intended it to furnish. When the attempt is made to overcome the transparent property by using the lake heavier in body than is natural to it, the usual brilliancy of the lake is clouded and permanently blurred, and the desired covering power is not secured. It is an utter impossibility to render a strictly transparent color opaque by thickening the consistency of it in the mixing pot. Desirable surface conditions and depth and strength of lustre are alike sacrificed in the trial.

The Browns.

Van Dyke, Pale Amber, Hazel, Portland Amber, Olive, Bismark, Orange, Coffee, Indian and Amber brown are on running parts, most advantageously used as color-and-varnish coats. In all respects they are superior to the same colors used to dry flat. They have richness and finish which the flat coats do not have.

Miscellaneous Colors.

The blacks are used both upon bodies and running parts as color-and-varnish pigments. Black color-and-varnish, in fact is the popular coating-up pigment where black surfaces of fine lustre and texture are sought for. Indeed, if the black color-and-varnish were not used and the black were brought up in flat color, followed with clear varnish coats, the color when finished would be decidedly green rather than purely black. Black color and varnish should be furnished with a ground free from defects and should be used to give the ground a rich, deep, dense, and intense black color. And so we might continue with the maroon—a color popular in all the country just now as a panel and carriage part color—with London smoke with Bergundy, with Wine color, Copper color, Vienna brown, Chocolate, Cobalt blue, English vermilion, and a vast array of other colors finding use in the carriage paint shop. As varnish colors or glazing colors, they materially help the painter to win success in his business, but as flat or dead coat colors, they handicap him to a disastrous extent.

The Setting of Tires.

Prize Article.

R. O'HEARN.

Place wheel, back up, on anvil, and mark between joint bolt holes with center punch. Don't use file. Mark right wheels with two dots and the left with one. When wheels are done and ready to be put back on job the dots will tell which are right and left, and no time need be lost, nor mistake made in getting them back on their own spindles. Throw away all old tire bolts. There is enough time wasted with one old bolt to pay for a dozen new ones. The bolts out, stand wheel on floor and drive it through by striking back of rim carefully and over the spoke, confining blows to about four spokes, none of said spokes being next to joint of rims. We find a bad spoke. It must come out. How? Place wheel, face up, on wheel bench, screw down, knock off rim, being careful not to break any tenons. Take firm hold of end of spoke and bear down with left hand—if right-handed—and strike face of spoke sharply with hand-hammer. Then take hold of spoke with both hands and work it up and down and out it comes. Glue spoke before putting in hub. Be sure to have tenon short enough not to reach box. Saw off tenon and put back rim. Did you mark face of rim before removing it? No? Well, you should do so when there is no stripe to distinguish face from back. A pencil or chalk mark will do.

Wedge all spokes slightly where they don't need much, but where we have loose tire, all the spokes will need some tightening, some more than others. Don't make your wedges. If you do your work well, you will be kept so busy you won't have time to make wedges when you can buy them for 45 to 55 cents a thousand. Your wheel wedged and joint properly sawed out or filled up, as the case may be, trim off the end of spokes with a gauge chisel. You will thus allow the tire to rest on the rim instead of the spoke end. This done, take an old file in both hands and draw-file the rust and grit off. Your wheel is then ready for the traveler.

Let us see; this is a No. 1 flange, Sarven patent wheel, and gone back slightly. Well, with a full $\frac{1}{4}$-inch steel tire the wheel can be brought to a $\frac{1}{2}$-inch dish with $\frac{1}{8}$-inch open joint and full $\frac{1}{8}$-inch draw, with one spot of heat in tire. Shrink tire in space near joint bolt holes

opposite joint marked with center punch. If the tire needs a ¼ inch give it ⅛ inch at each side of joint holes; this will take a little longer but will be better work than if shrunk all on one side. If as much as ¼ is not needed shrink all in one place.

Place tire on the marked joint holes, putting a burning iron or old $\frac{3}{16}$ inch bit in one of the holes to hold the tire in its proper place until cooled.

Never get a buggy tire so hot that water will be required to keep it from burning the wheel.

A Sarven wheel that has been dished too much may be remedied to some extent by the following methods: Remove tire, and put wheel in press, which will open the joints, into which insert leather sufficient to make up for the amount of rim, which had been sawed out too much. Run and fit tire for scant straw draw, and put on tire. While it is cooling, place wheel on anvil, face up. For extension flange place a piece of ½ inch iron, 2½x2½ or 3x3, on point. A heavy blow with a 10 or 12-pound sledge will have the effect of setting the flange against the spokes. Then tighten rivets well, and the dish will, to a great extent, be taken out and the wheel be none the worse for its previous over-dishing. For the short flange set the flange down with fuller and set-hammer and tighten rivets.

The wheel being bolted off, be sure to have the felloe plates neatly set up to the rim. This is something which some will overlook if the blacksmith doesn't oversee the work.

Wipe off spindles and oil up before putting on wheels. That without extra charge. For washers on axles charge as usual. Try with your S-wrench the cap nuts on pops and goose neck. If you can tighten up without washers do so without charge. Tighten single tree bolt free of charge if it can be done without trouble. All such little attention will clinch your customer as a regular patron. These little things might as well be done while he is getting ready to drive away. Call his attention to anti-rattlers, a new whip socket, a bent back lazy back, worn shaft eyes or bolts, bad back-stop, a storm apron, new spring cushion, and a dozen other things which he probably would not notice until another member of the craft —if you don't—will call them to his notice.

Don't let any man get away from your shop with loose shaft tips. As I said before, do all the little extra stunts, the ones you are not going to charge for, while your customer is looking on.

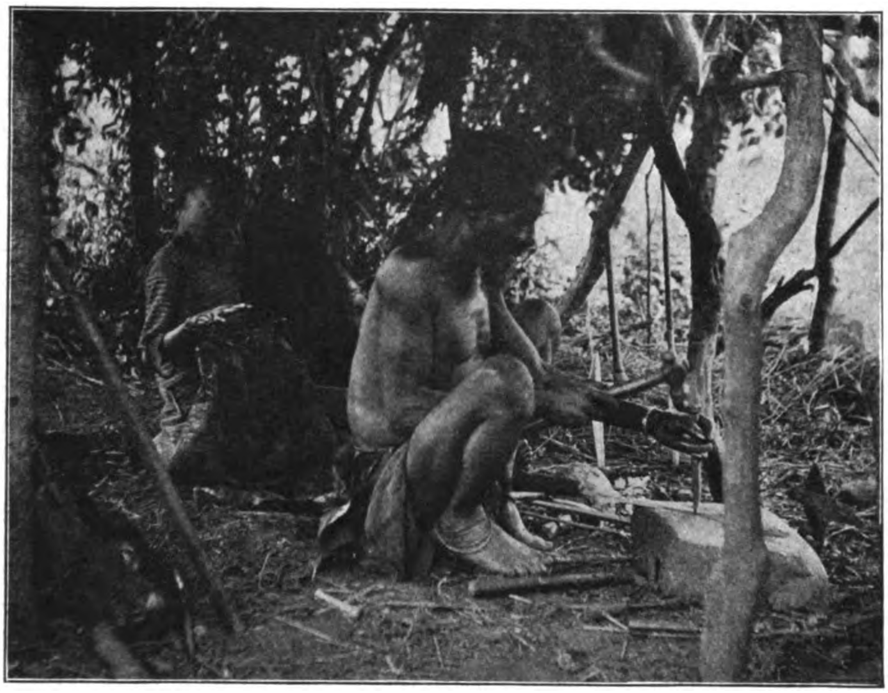
Here's something like an epigram. A dished wheel is never rim-bound. I have seen some smiths, however, saw into the point of a wheel that already had an inch dish.

Better remove flange rivet before trying to remove defective spoke. This is the best and safest way and will not cause any trouble in the end.

If the foregoing remarks are closely followed, I know the smith will have no trouble in setting tires.

Tyandiramba, an Old Smith of Zululand, South Africa.

Through the courtsey of J. H. Williams & Co., of Brooklyn, N. Y., we are able to present our readers with an interesting picture of an old native South African blacksmith, as he plies his craft in the heart of Sululand wilds. The letter accompanying the photograph is written from Mt. Silinda, Rhodesia, South Africa, under date of Jan. 4, 1904, and we reproduce it in the words of Hr. C. C. Fuller, correspondent of the J. H. Williams Co.



TYANDIRAMBA, AN OLD NATIVE SOUTH AFRICAN BLACKSMITH AND HIS HELPER.

"Herewith I hand you two pictures of 'Tyandiramba,' the old smith who was head armorer for the great Zulu prince, 'Gungunyana,' before the Portuguese war, in which the chief was captured by treachery and his people subdued. Tyandiramba (Chanderamba is about the way it is pronounced), is not a Zulu or even a 'Shangan,' but he was elevated to a position of dignity by Gungunyana, in spite of his 'Mandow' blood, and was given the right to wear the Zulu badge of honor—the 'ring' on his head. I am sorry to say the old man took off his ring only a few weeks before I got down to take the pictures.

"You may be interested in hearing something of my experiences in securing the pictures. Leaving here after dinner, December 18th, I rode my wheel and walked ten miles south to the store of Mr. John Ballantyne, a Scotch trader from whom we buy a considerable part of our supplies. This is the end of any road to the south other than the narrow native paths. I had intended to try to get the pictures that day, but Mr. Ballantyne suggested that he would send a boy over to tell the old man of my coming and to ask him to have everything in shape for the next morning. That night I spent at Mr. Ballantyne's, and I wish you could have listened to the yarns he told of life in Africa, for he has been here twenty-three years, and has seen about all there is to see. He is one of the best Kaffir traders in Africa, and we esteem him highly.

"As soon as the dew was off the high grass a little the next morning, I started with my boy and one of Mr. Ballantyne's boys for a guide. It was a beautiful morning, and a pleasant walk across a fine valley, then up a high range of hills and down into another large valley

Nearly all of the way we walked through native gardens, and ran into one big 'beer drink,' where scores of men and women had gathered to drink 'utshwala' and dig into the garden of the host. Mr. Ballantyne had said it should be about $2\frac{1}{2}$ or 3 miles, but, said he, 'the path is pretty wobbly,' and so I found it. After an hour's hard walking, we met a man who told us we were on the wrong path, as the smith had moved, so we turned back and finally found his new kraal. It was with disappointment that I first saw the little grass-thatched shed which served as his shop, nor was the old man present. But we soon found him and he had his bellow (the two skins which the boy operates in the picture) and other tools brought down and put in place. By a little study you will understand it all; the two skins which, working alternately, force a steady current of air through the wooden tuyeres into the clay forge. You will notice that the anvil is a large stone, but instead of using a stone for a hammer, as some natives still do in the far interior, you see he has three iron hammers. He uses English, Portuguese and native, 'Amakalanga' iron and some steel. His work is very good, as you can judge somewhat by the fine spear and battle-axe which he has finished. He does both wood and iron work, and is working on another spear. The spear shown in the picture is one of the finest I have seen. He had made it for someone and would not sell it to me, but promised to make me one just like it for two shillings, 50 cents, and only asked 75 cents for the battle-axe. Returning to Mr. Ballantyne's for dinner, we came home that afternoon well pleased with the trip.

"I am very sorry the pictures are not better, but you have no idea how hard it is to get fine ones here. In the first place it takes so long to get plates and paper out from the United States or England. Then owing to the damp climate it is almost impossible to keep them or chemicals. When I came to develop the negatives I found that the plates had begun to spoil, but if I had fresh paper, it would be possible to get some fair prints. In order to get better light, I had the sides and part of the top of the hut taken away, but you can see that it interfered with the pictures.

"You may be glad to know that in June we brought the engine and one wagon safely into Mt. Silinda, that during the following months the saw mill and other machinery came in by big 14 and 16-ox teams from Umtali, and that after months of hard work we started the saw mill November 19th, just one year from the time we reached here. We have sawed considerable lumber, and have everything in good shape for the rainy season now beginning."

Tools for Axle Setting and Their Use.

Prize Article.

C. YOUNGSTROM.

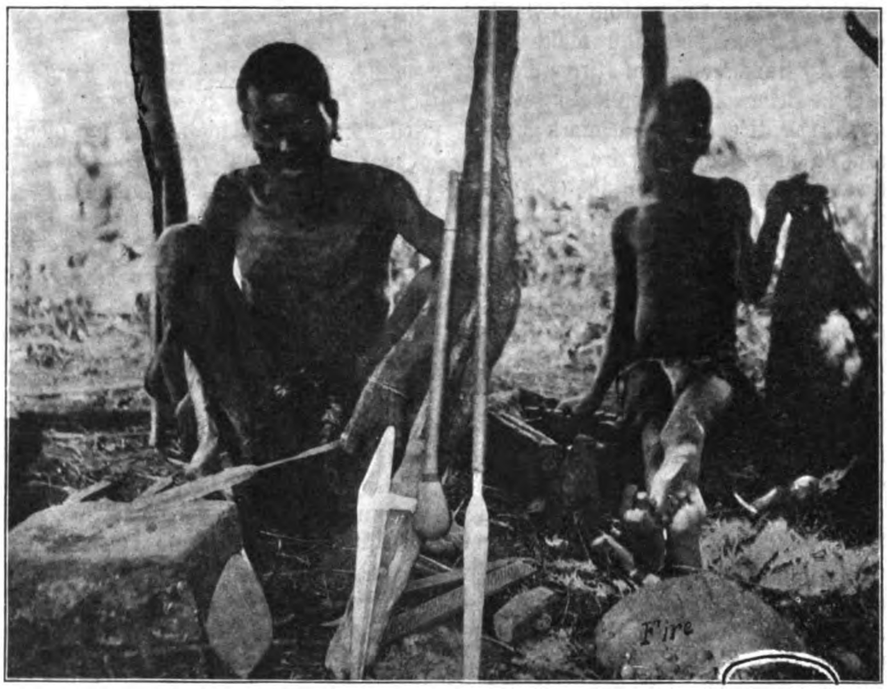
In all carriage building quality of materials is of first consideration, but it cannot be so in a general repair shop where materials are not selected. There comes the consideration first, how to bring the material into the best use.

The foundation for a carriage is the wheels and the axles, and to put them in proper relation to each other is what I will try to explain. Take an axle perfectly straight, put it in the wheel and the wheel will stand true to the centre line of axle, i. e. like a belt pulley to its shaft. Why do we try to disturb that harmony? The reason is this: The spindle of an axle is more or less tapered, so when the wheel revolves it works its way towards the end of spindle. The setting is done to counteract this. One way is to bring the ends of axle down. Another way is to send the ends of axle forward. For buggies and wagons with narrow tires, both ways are used, each in a less degree. In wide wagon tires only the forward setting can be used to advantage.

This in spite of what all "Plumb Spokers" say on the subject. The amount of setting is often overdone, and a little too much is better than a little too little. The happy medium is reached when the wheel keeps up to the collar without friction. I am not prepared to tell where this happy medium is located for it depends on the road, the load and the tapering of the spindle. I will leave to each smith to settle the amount to his own satisfaction, but will show the way to get just that amount of set without using any figures.

I will first give a description of a few tools which I use; they are simple and accurate. The first one, Fig. 1 A, is a testing bar to find out how the wheel stands to axle at the start. Take a rod of $\frac{1}{4}$ inch round or square iron $9\frac{1}{2}$ feet long, and bend it in centre, staple-fashion, leaving loop big enough to take a $\frac{1}{4}$-inch bolt. Weld ends together, split open for $\frac{1}{2}$ inch and bend stubs out 45° each. Take another piece of iron $\frac{3}{16}$ x $\frac{3}{4}$, and 8 inches long, punch one hole $\frac{3}{8}$ inch in one end. Next make a little washer $\frac{1}{4}$ inch thick to go over $\frac{1}{4}$-inch bolt and inside $\frac{3}{8}$-inch hole in the last iron. Leave it there, put in a $\frac{1}{4}$-inch bolt, put bolt through loop in the first iron, slip on $\frac{1}{4}$-inch common washer, screw it up and the tool is ready for use.

The next tool is a setting gauge, Fig. 1 B. It consists of a bar $\frac{1}{4}$x1 inch, 5 feet long, split open at one end about 4 inches and forked as in Fig. 1 B. Even the ends up, double them over and weld



TYANDIRAMBA AND HIS SMITHY, SHOWING FIRE, ANVIL, AND THE WAY HIS HELPER MAKES BLAST.

to form nuts for $\frac{3}{8}$-inch bolts. Make the bolts, one 2 inches, and one $2\frac{1}{2}$ inches, flatten the heads to $\frac{1}{16}$x$\frac{3}{4}$, and cut off square. Next cut off 4 pieces of iron $\frac{3}{16}$x$\frac{3}{4}$x7 inches long and bend like as in Fig. 1 C. Bore two quarter-inch holes in two of them, put on the bar and mark holes in the other two. Bore holes, screw on. Cut threads on the two $\frac{3}{8}$-inch bolts, as close to heads as possible. Tap out holes in end of bar, put in the bolts, square up the heads with a file and the gauge is ready. The idea of having the heads of the bolts flattened is this: In the process of setting, the centre of end of axle comes more and more from centre of gauge, and impairs its accuracy; but by the heads being flat its centre is, so to say, expanded to the width of the bolt head, and the gauge can be set to an accuracy to within $\frac{1}{32}$ of an inch.

Now to find out how the wheel stands at the start. Put axle in wheels. Turn axle back side up, fasten a little screw clamp on axle close to the collar at end not to be tested. (See Fig. 1 D). Take testing bar, Fig. 1 A, put forked end against clamp screw, and bring the other end up to where the bottom of wheel is to be. Loosen bolt and make joint close to inner edge of tire. Fasten screw. Bring short end to evenly touch the tire, make a mark across iron at inner edge of tire. Proceed in same manner at other side (top) and note difference. Now to complete the problem by figures already started let us say there is a difference of one inch the larger distance at top of axle. The difference desired, $1\frac{1}{2}$ inch say, will have to be increased by $\frac{1}{2}$ inch. Keep this figure in mind. Turn axle top side up, move clamp in position and find out the difference in front and hind, note difference, and if the longest distance is in front add it to $\frac{1}{4}$ (the gather desired). If longest distance is at back, some of setting in the right direction is started and the difference is to be deducted from $\frac{1}{4}$ inch. This operation done, the next is the setting of gauge. Next lay axle top side up on a board and if bent down in centre, back it up to hang free. Have a piece of straight iron two feet long bent up about $\frac{1}{4}$ inch on one end. Place this bend under axle one inch inside of shoulder, (place where axle is to be bent). Block under the iron so the axle rests on it at bending place and at the end (see Fig. 2 A). Now measure off on iron bar half the diameter of wheel, at which place a post should be set. This post can be set beforehand and the axle put in the proper distance from posts (which invariably is half diameter of wheel from place of bending). The special job here on hand is to increase pitch $\frac{1}{2}$ inch. Now bringing lower part of wheel in $\frac{1}{4}$ inch throws upper part out $\frac{1}{4}$ inch, thus giving the pitch wanted. On post B, Fig. 2, mark off $\frac{1}{4}$ inch from under side of bar. Bring bar down to the mark and there will be an opening between end of axle and the bar. That opening is just the amount of set needed to bring the desired results. But how measure that opening accurately? I do it in this way: I take a slim tapered wedge and insert between axle and bar. Mark the wedge at end of axle. (See Fig. 2 B). To be sure I picked up an old broken wooden rule and made the

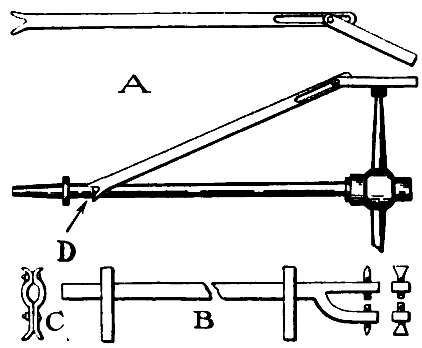


FIG. 1. TESTING BAR AND SETTING GAUGE USED IN AXLE SETTING.

wedge out of it, which gives me plenty of marks to go by. Turn the axle over bottom up and apply the gauge.

For convenience I made a plumb weight to hold the gauge for me—it explains itself. It hooks over back of gauge. The gauge secured, put the wedge where it is marked to be and adjust the screw as near as can be, and the gauge is set for bottom pitch.

To find out the front gather proceed same way as for the bottom. Put front side of axle down, and ascertain the amount. I use the long part of gauge post for bottom side and the short ones for front side. Remember that the amount to be set is only half that of the difference desired in the whole wheel. This with reference to the movement of bar at Fig. 2.

Now the gauge is set and now the only thing left is to set the axles to the gauge. There will not be any difference between the wheels, provided they have some dish and the boxes set true.

These operations apply only to first end of axle, and can be performed in quicker time than it takes to read this. When gauge is once properly set, mark the screws so they can be turned back to place instantly, should they for any reason have to be moved, or in case somebody else should happen to tamper with them.

The tools here described are a blessing to the blacksmith and any smith can make all of them in three hours' time for less than 50 cents. The gauge can also be used for setting an axle cold if the buggy be blocked up in such a way as to leave bottomside and one side free. If both ends of axle are sprung, simply set the gauge right and go to work. If one end of axle is considered fair, adjust the gauge to that end and bring the other end to the same gauge.

Pointers to the Repairman.

Prize Article.

G. A. BISHOFF.

This should be a great prize contest, as it covers a great field of industry, and has in its lines a class of mechanics of which the world can be proud of. For the benefit of those few, who know less than I do on the subject, I will give my methods of conducting business, and repairing buggies and carriages.

Let me say that I have worked in most of the states from the Atlantic to the Pacific, and from Canada to the Gulf. Coming to Gainesville, Texas, I opened a repair shop in an old building, 24 by 30 feet. It seemed to me that the world was cold and the future dark, but I went to work with a will, with a helper the first year or two. Little by little I enlarged, and today I have the largest carriage works in the city, building and all paid for. I employ on an average of 12 men. This is simply intended as a word of encouragement to those about to despair. If you have not succeeded, try some new method. When I opened for business in this city I did not always have work, but I never sat down, summer or winter. I always found something to do to keep the anvil ringing. Between jobs I would make tools until I had plenty, and then I would make odd size shaft clips, shaft irons, lap rings and links, work over old axles and fit boxes to them, rebuild an old buggy or an old wagon to sell. One can always find something to do. Besides realizing a profit out of the work, you make a good impression on your neighbors, and on the public, and they will naturally think you must be all right for you are always busy, and will not forget you when in need of anything in your line. I would not do any work without a fair profit, and under no circumstances would I do a poor piece of work. If I had underpriced a piece of work, I would never slight it, even though I lost. I guarantee all my work and make good all work that proves unsatisfactory, to any

reasonable customer. I never do any extra work on a carriage without first getting the owner's permission. I was always afraid he might think I was hungry for a job, and thereby loose his confidence and perhaps his trade. I am always careful to finish all work neatly and then to paint it to correspond with the job so as to conceal any sign that it had been repaired. In this you are sure to please your customer, as everybody likes neat work well finished.

A few words about every-day repair work: I set all axles not bent in the center with an axle set, of which there are several makes. You can find one or more in any good tool catalogue, or if you prefer you can make one at a small expense. They are very simple, and easily made. They are usually sold for about $3.00. With it you can set an axle in about ten minutes without taking it from the buggy. You can't afford to be without one. When setting new axles I set hind axle first, making the wheels at the top three inches wider than at the bottom, and one-half inch wider at the back than at the front of wheels. This will insure a good running axle, one that will not crowd the nut or cut out the washers; on heavy work or low wheels I make the wheels only two inches wider at the top than at the bottom.

When I put one new shaft in an old buggy I am always careful to see that the new shaft has exactly the same bend at the heel, that both are the same length and are square from the crossbar to point of shaft, for if you fail to true the shaft the buggy cannot run true, but will run to one side, causing a dragging of the wheels and cutting of axles.

Much has been said about welding springs. It is just as easy as many other things, if you go about it the right way. I upset the ends *well* before I scarf them, groove the scarf to keep them from slipping, and use lump borax to weld. Be very careful not to get the steel too hot, for if you do it is sure to break. After the spring is welded hammer it cold. This will give it all the temper it needs. When putting tires on new buggy wheels I give them one-eighth of an inch draw and always put the weld over a spoke, as there is less strain and it is less liable to break there than at any part of the wheel. In resetting tires on old wheels I give only $\frac{1}{16}$ inch draw, for the wheel will not stand as much draw as when new, and is more liable to dish. When resetting tires I am always careful to saw out the rim and upset the tire on the same side so as to avoid changing holes in rim, which is necessary for good work.

It was a good many years before I discovered an easy way of getting off a broken bow socket. I now use a No. 2 bolt cutter to cut the rivet between the two eyes at the bottom. To get the socket of the bow, split it with a sharp cold chisel and it will fall off. Try it and you will not dread this work any longer.

Seventy-five per cent. of buggy bodies become loose at the joints about the seat. A simple way to make a weak body strong when the joints have become loose and the bed sways from side to side, is to put in a one-piece brace from sill to seat, from seat to opposite sill. On heavy jobs put two bolts in seat frame.

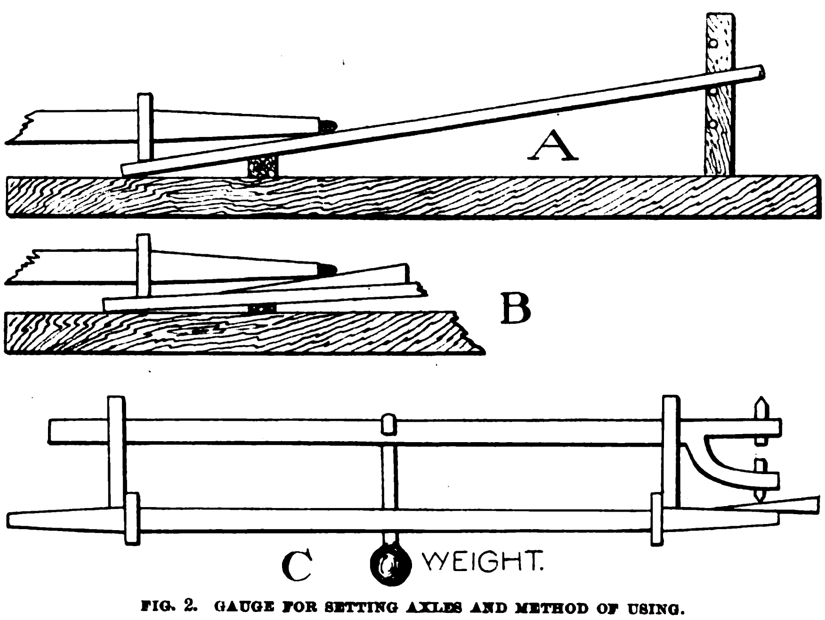


FIG. 2. GAUGE FOR SETTING AXLES AND METHOD OF USING.

Another difficult piece of work is to get the wrinkles out of a carriage fender that has been crushed so as to cause it to wrinkle. If left in this condition it is ruined forever as far as looks are concerned. To take the leather off is very expensive, as it must be sewed on again. I formerly took the leather off; now I only cut the stitches on the outside where the iron is bent, push the leather aside, pull the iron straight, or use a hammer if necessary.

Something else I learned by experience—when I have a bent bow socket to straighten I never strike it with a hammer, for if you do you are sure to dent it. Pull it straight with your hand. If you are not able to do this use two pieces of grooved wood and a screw clamp to straighten it.

When respoking any kind of wheel it is important to have the spokes opposite each other and parallel. If you are careful in this you will not be troubled with bent spokes. It is also important to see that the joints are true when putting on the rims or felloes; this will prevent them from creeping out from under the tire.

When repairing rubber tires it is important to examine the channels, for by the time the rubber tire needs repairing there is sure to be at least $\frac{1}{8}$ inch rust in the channel. This can best be cut out with a cold chisel, and by doing so you will not be troubled by having your tires come off or turn in the channel. When brazing the wires you can prevent burning paint off the rims by using a piece of asbestos under the wires.

In re-covering dashes or fenders much time and trouble can be saved by first sewing two sides and one end, and then putting in the frame. By this method you will prevent wrinkling, which is so much to be feared.

I make a good many cushions and I find by experience that it is much the cheapest to first make a frame of wool to fit the seat. You can then tack on the material and finish it without doing any sewing, thereby saving time and getting a cushion that will hold its shape.

In painting buggies I learned by experience that a varnish that dries quickly and with a hard surface is less liable to spot than a slow drying varnish, which is more delicate and therefore more liable to spot.

How I Made a Trip Hammer.

A. BRUTON.

I took two pieces of wood 8x8 inches and four feet long, put them down eight inches apart, and taking another piece 8x8 by three feet, bolted it between them at the back end for an

upright. Next I put a piece 8x8 by one foot long between them at the front, and bolted it there as the base for the anvil stand, which I made out of a piece of iron 1½ by 1½ by 2½ feet long. I welded a heavy plate on the bottom end of this and bolted it fast to the base. After boring a hole in the upper end, I squared it into a 1-inch hole. I made an anvil die of tool steel with shank to fit this hole in the stand, after which I drilled a small hole through the stand and shank and drove in an iron pin as a key to hold the die.

Next I made two straps of new wagon tire, bolted to back upright on each side with a ¾-inch hole through the ends for a bolt to fasten hammer arm to. This latter I bolted to a tee of the same material, turning the end of the cross tee to fit between the short pieces on the upright, fastening with a ¾-inch bolt. The arm I made from the large part of a buggy tongue, and hammer out of a sledge, swelling the eye about as large again. I cut off about one-half the large end and dressed up, using the pein for the face of hammer after dressing this up also to suit the work. I next braced it both ways solidly. I used an old crank shaft of an old mowing machine for my crank shaft and also the pitman rod for driving the hammer. I made a loop or strap out of wagon tire also to fit over the arm extending above and below about ten inches, and put in coil springs there to take off the solid blow from the arms and hammer and also to throw the hammer up as a support to the pitman. This pitman I screwed in the lower end of the loop under the arm and placed a clamp on each side of the loop on the arm, to hold springs and loop in place. By moving the clamp and loop backward and forward I can regulate the stroke.

Next I put a crankshaft in its old boxings about one-third way from back end of the base of hammer, and put a pulley wheel on outside end for belt to run in. The belt tightener, of course, can be fastened to the base or back upright to work with trip, which can be made of anything handy that will stand the pull on the belt tightener. I have mine fastened to a separate post which is right by the hammer, to which I have a countershaft fastened on account of my engine running opposite to the way I wanted to turn my hammer. I put in a short countershaft and then ran a loose belt from it to the hammer. For another thing, it gives a steadier belt by making it shorter, as six or eight feet of belting running loose from the line shaft to the hammer will flop, unless it is wide and heavy.

I have sharpened plows in twenty-two minutes on my hammer and welded 1¼-inch axle stubs, after taking first heat with hand hammer. It works fine and cost me about $30.00, all told. My springs are of $\frac{5}{16}$-inch rods (or wire) but ⅜-inch would be better if not coiled too close for the hammer spring.

This trip hammer has been in almost constant use since it was made, and gives entire satisfaction, as it is a great labor saving device. I would advise all smiths who do work, where such a hammer could be used, to make one. The expense is small and the hammer will soon pay for itself.

FIG. 1. ELECTRIC GAUGE FOR MEASURING HIGH TEMPERATURES.

A New Electric Gauge for Measuring High Temperature.

In our various industries, accurate means are provided for measuring the different properties of the various materials which enter into the construction of the vast outputs. Lengths are measured with the greatest accuracy by aid of delicate mycrometers, weights by scales of various degrees of delicacy, densities by hydrometers, and the composition of the various materials by chemical analysis, etc., but while the lower temperatures are read by the aid of the mercurial thermometer, in these industries, the higher temperatures seem to have been left to be guessed at, or measured by the observations of skilled operators. The operators estimate these temperatures by the color or degree of incandescence of the materials which are being heated. There are various pyrometers on the market for measuring these temperatures, still in the general case, the old method seems to be resorted to. The reason for this lies probably in the fact that the pyrometers which have been available have lacked either in adaptability to the work, or inconstant reliability as to their indications.

It is well known that the value of the finished product depends in a large measure upon the accuracy with which the heat treatments have been conducted. The cost of machining tools, as well as the quality of the finished tools, depends in a large measure upon the temperature at which the steel has been annealed, and the keenness which can be given to the edge of tools and also the length of time the tool can retain its sharpness, depend altogether upon the temperature at which it is hardened and tempered.

In many steels the range of temperature at which they can be successfully hardened is very small, but in no steel can the best results be attained in a variation exceeding 50° Fahr., whereas, in most steels the variation of one fourth this amount would prove injurious. Observations have shown that the better grade of steel, or the steels which are capable of producing the best tools, are those which can be hardened successfully only within narrow limits of temperatures.

On account of the interest and importance of the correct measurement of temperatures, each new pyrometer that comes out is of interest to the public just in proportion to its possibilities in filling the requirements. Just now the Morse Thermo-Gauge Co. of Trumansburg, N. Y., are bringing out a Thermo-Gauge which will be of considerable interest to the trade. This Thermo-Gauge is based on the comparison of color or degree of incandescence, and is covered by seven United States patents, issued in 1902 and 1903.

While these patents cover a multitude of forms, the Gauge which is generally used is illustrated in Figure 1. In further explanation of the construction of the Gauge, we would add that inside the lamp tube illustrated, is

provided an incandescent lamp with a large filament in the form of a conical coil. This filament is heated to the different degrees of incandescence corresponding to the different temperatures by an electric current taken from a storage battery. In the circuit of the lamp is included a delicate ammeter and a rheostat with finely divided increments of resistance. With the aid of the rheostat the amount of current passing through the lamp can be regulated to any degree and can be read on the scale of the ammeter. A table accompanies the instrument, which will enable the operator to know the temperature of the filament by the readings from the ammeter.

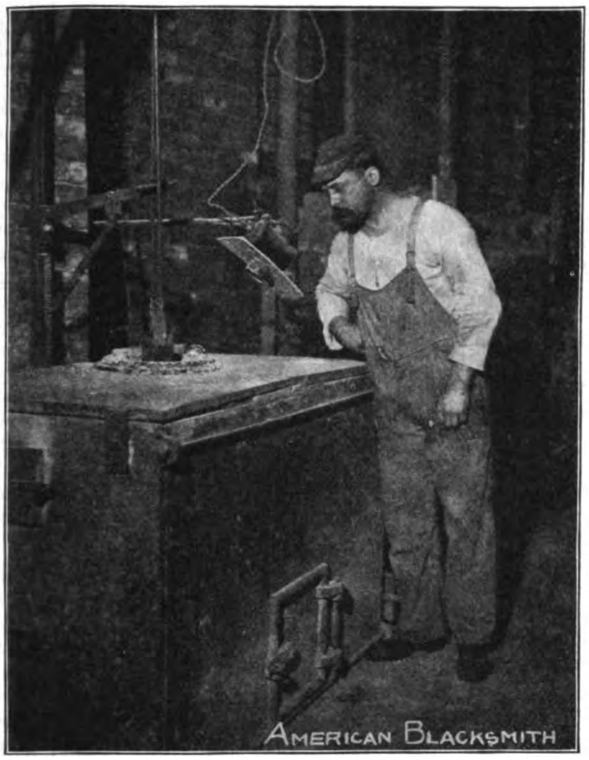


FIG. 2. READING THE ELECTRIC GAUGE.

When this filament is superposed over the substance, whose temperature is to be gaged so that the substance can be viewed through the spirals, it will appear as a more or less bright spiral against said substance, if it is at a higher temperature than the substance. On the other hand if it is at a lower temperature, it will then appear as a more or less dark spiral against it, but when the substance and filament are at the same temperature, then the filament will apparently be obliterated from view and appear to merge into that of the substance. This is because the rays then emitted by the substance whose temperature is to be gauged are identical with the rays emitted by the filament, and therefore the eye detects no difference. This merging effect is a well-defined phenomenon and will enable the operator to read temperatures accurately within 5° Fahr.

If it is desired to measure the temperature of any substance heated to incandescence, the substance is viewed through the lantern tube and the coils of the filament, and the incandescence of the filament is changed by the rheostat until it merges into the substance, when it will be at the same temperature as the substance, and the temperature can be read by the aid of the ammeter and the table accompanying the instrument. If, on the other hand, it is desired to heat a substance to a certain temperature, then the current is regulated by the rheostat until the ammeter indicates the desired temperature, then as the substance is heated, it is observed through the tube and the instant that its temperature is such that the filament of the lamp merges into it, it will be at the desired temperature.

This in general is the principle of the Thermo-Gauge, but by its thorough adaptability to reading temperatures. The Gauge is already in successful use in many of the prominent factories in the country, and has already demonstrated its practicability and importance, among other ways in the hardening of tools.

The Cause and Cure of Thrush.

W. B. ALLEN.

Every farrier knows what thrush is. While all horses are subject to this disease, it is more liable to occur in the heavy draft horses of cities or of wet marshy country localities.

Common causes of thrush: Filthy stables, contracted heels and excessive work on rough roads. Navicular disease is also apt to expose the animal to thrush.

Symptoms: An increase of the moisture in the cleft of the frog and an objectionable odor. This is followed as the disease goes on, by a thin, bad-smelling discharge of considerable amount, which gradually changes to thicker matter, tending to destroy the frog.

Treatment: Cleanliness and a removal of all possible causes should be first looked to. Pare away with care the ragged and diseased parts of the horn. A poultice which is well recommended consists of boiled turnips. Keep this poultice on for a day or so. The smell may be done away with by adding a few drops of carbolic acid or a handful of powdered charcoal to the poultice. Next clean the cleft of the frog and the grooves and fill them with dry calomel. Dress the foot with oakum and a roller bandage. The dressing should be changed every one, two or three days, depending upon how profuse the discharge is. Feet which are subject to thrush should be protected in the stable by means of leather boots.

While thrush is a disease which every horse is capable of contracting, yet this trouble is rarely found in well groomed animals. As stated, in wet and marshy sections this disease is more prevalent than elsewhere. If the above outline of treatment is closely followed thrush can be remedied.

FIG. 3. TAKING FURNACE TEMPERATURES.

The Blood Horse.

BARRY CORNWALL.

Gamarra is a dainty steed,
Strong, black, and of a noble breed,
Full of fire, and full of bone,
With all his line of fathers known;
Fine his nose, his nostrils thin,
But blown abroad by the pride within!
His mane is like a river flowing,
And his eyes like embers glowing,
In the darkness of the night.
And his pace as swift as light.

Look—how 'round his straining throat
Grace and shifting beauty float;
Sinewy strength is in his reins,
And the red blood gallops through his veins;
Richer, redder, never ran
Through the boasting heart of man.
He can trace his lineage higher
Than the Bourbon dare aspire,—
Douglas, Guzman, or the Guelph,
Or O'Brien's blood itself!

He, who hath no peer, was born,
Here upon a red March morn;
But his famous fathers dead
Were Arabs all, and Arab bred,
And the last of that great line
Trod like one of a race divine!
And yet,—he was but friend to one,
Who fed him at the set of sun,
By some lone fountain fringed with green:
With him, a roving Bedouin,
He lived (none else would he obey
Through all the hot Arabian day),
And died untamed upon the sands
Where Balkh amidst the desert stands.

HEATS SPARKS WELDS

April showers—summer's baptism.

Industry is a bee whose honey is comfort and happiness.

Time's coming for tires to be set. Ready for it?

Don't touch the frog, except to remove such layers as are very loose and form no protection.

Perhaps that old forge or bellows needs repairing. Better get new tools before rush times come. Get the best.

Ride a cock horse—if your hobby has anything to do with your work it will pay you to ride him hard and often.

Great weight of iron is to be avoided in shoeing—especially should this be borne in mind with the approach of warm weather.

How about advertising your shop? It's necessary these days if you want to get ahead. Lots of ways of doing it, too. Think them over.

One month more still remains in which to send in your prize contest article on the advantage of gas or gasoline engine power in the smith shop.

No reason, is there, why smith shops should be dark holes? When you build have plenty of windows, and then don't forget what they are for.

Cheap tools are generally the dearest in the end when you come to figure in the time, money and trouble which their poor quality or need of repairs cost.

Four miles of standard gauge railroad tracks have been laid in the Transportation Building at the World's Fair and still the immense floor space is not exhausted.

When in doubt about how to shoe, observe the horse at a walk or trot. A good deal can be told by the way the animal stands, but much more by the way he goes.

A good time to look over your tools and replace the defective ones is now. Don't forget that the time you waste over that broken drill would soon pay for the purchase of a fine new one.

Reading maketh a full man—a true old saying. The go-ahead smith always has good craft books at his elbow and never lets the subscription to his favorite trade paper run out.

'Tis a good plan to have a regular time for running over accounts to see who hasn't paid up. Otherwise before you know it someone will be so far behind that he can't catch up—then you'll be behind.

Stop to think what side lines you can add with profit. How about wood sawing, feed grinding, disc grinding, horse clipping? There's a host of them. Can't you select one that will pay you? Branch out.

Every blacksmith who has an engine testifies in favor of power in the shop. Nothing would induce them to be without an engine. That's significant. Have you looked into the cost of an engine, its cost of running, what work it would do for you, what trade it would bring? Well worth considering.

Down in the mouth—many smiths think they're doomed to starvation prices forever. Seem to forget "the Lord helps those who help themselves." Be up and doing. Round up the boys in your neighborhood and talk over prices and things with them. There's a way to make a start for better things.

Iron exposed to the action of rain and the atmosphere corrodes quite rapidly. Bolts on bridges of the Thames in London have been found to be eaten away in 25 years from $\frac{7}{8}$ to $\frac{1}{3}$ inch in diameter. Many preservative coatings are used to prevent this action, such as cement, asphaltum graphite, red lead and other substances.

Spruce up the shop. Look over the accumulated odds and ends, discard that which is rubbish and sort that which is of value. Don't be afraid to use paint. A little water was never known to hurt window glass. You've no idea how much better satisfied you'll be with the old shop after a little spring cleaning. Customers appreciate such things, too.

On May first there will be placed on sale at all post offices in the United States a new series of postage stamps commemorating the Louisiana Purchase Exposition. A portrait of Robert R. Livingstone will appear on the one-cent stamp and of Thomas Jefferson on the two-cent stamp. It is interesting to know that 90,000,000 of the former are being engraved, and 225,000,000 of the two-cent stamps.

A thirty-foot knife blade.—The biggest carving knife ever manufactured may be seen at the World's Fair. This monster blade is 30 feet in length and has an edge as sharp as a razor. It is made out of the finest steel, and the handle is a masterpiece of the cutler's art, elaborately carved and beautifully polished. It would take a veritable giant to wield a knife like this. The blade is altogether of American manufacture, and it is expected to show for the first time that American cutlery has now reached a point of perfection where it fears no rivalry. The giant carving knife cost several thousand dollars, and special machinery had to be made.

Tom Tardy's secret is out! We know now why he got a horse. It seems he has always wanted to have a team of his own, and now Tom's dream is realized. We happened along Main street the other day, when, lo and behold, who should appear but Tom and his nag, the one occupying and the other pulling the sorriest looking rig ever eyes were laid on. The fact that it was the busiest time of day, and of a day when there was much shapening to be done, made no difference to Tom. Our worthy friend was much pleased to learn later that we had seen him driving in state, but no amount of questioning would drag from Tom why he was there or whither he was bound. Surely, man is much given to display, and Tom's rig was a show all in itself—but then that's another story.

Do you know just how much each job you do costs you? It is all very well to charge the established price for such and such a piece of work, but do you know accurately what the profit is in each case? It pays to sit down occasionally and figure on prices of work you have done. Figure in just what the material for the job in question costs you laid down in your shop. Figure in your time and also your helper's. Add a proper proportion for coal, rent or taxes, fuel for engine. Get right down to your actual costs and you will then know how low you can figure on the next job of the kind and still have a decent profit left. Very often you want to cut out all profit in your figure to a new desirable customer whose permanent patronage you wish to get in line with, and here again an intelligent knowledge of costs is of much value.

Ruts are bad things. All too many smith's form the habit of expecting only so much trade each year. The man who progresses is he who is in the habit of continually seeking how he may grow. Many ways are open to the smith for an increase of earnings, depending upon locality and ability. With some the first step is an engine, which makes possible, wood sawing, feed grinding, disc sharpening and the like. A power hammer is another move in the same direction. Often a circular saw, planer or band saw can be added with profit. Perhaps there is work for a machine repair shop—a lathe immediately suggests itself. However, an engine is not essential to the smith who would branch out. A tire setter in this neighborhood or a horse clipper in that may be found profitable. Some smiths make a specialty of brazing broken castings; others in their spare moments build new vehicles, rebuild old ones, or buy jobs in the white to paint. Again, to act as agent for farm wagons or implements is another possible source of profit for the man who would get out of his rut. But whatever side line you take up, advertise it far and wide in the locality from which your new trade will come.

American Association of Blacksmiths and Horseshoers.

If any blacksmith thinks that no benefit can come from a movement to organize the shops in any locality unless every single one agrees to join, he is much mistaken. The greatest success results, of course, when not a single man stands out, but any effort to "get together" for better prices is almost sure to improve conditions, both directly and indirectly. Attention is called to the following letter:

> "I feel deeply indebted to you for the better prices which I am getting for my work, which has been a great help. There was not enough sand in some of the blacksmiths of this county to get together and raise the prices, although so many of us have been kicking for a long time about the low prices. You have done a great thing for us in forming the Orleans County Association of Blacksmiths and Wheelwrights and I feel that all the smiths should take your valuable paper." WM. BEEL.

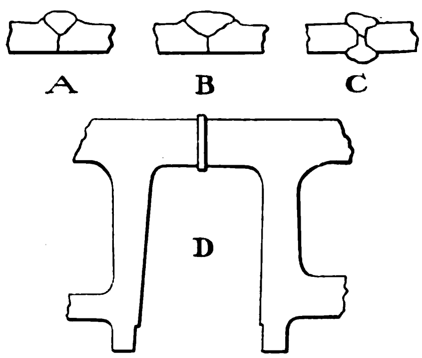
Here is a case in point. Some few smiths in this county obstinately refused to listen to reason, but benefit was derived from the effort made to raise the scale of prices throughout the county. The point we wish to make is this: No man who is thinking of starting a movement for better prices should hesitate because he fears every shop will not join. Very often the ones who are blind enough to want to "stay out" do not control enough trade to make it worth while considering them. A strong, persistent effort in presenting all the many arguments and advantages of organization is almost sure to bring sensible craftsmen around, even if they do not at the very start acknowledge that the best course for them individually lies with the organization.

The American Association of Blacksmiths and Horseshoers, together with its official organ, THE AMERICAN BLACKSMITH, would like to see an organization of blacksmiths, horseshoers and wagon builders in every county in the land, and will be glad to lend every possible assistance towards making a start. There are many reforms and benefits which the craft could secure if they were solidly organized. Any smith can start the ball rolling in his locality. Let him send to us for an outline of plans for taking up the work. Now is an excellent time to make a beginning, as the roads will soon be in prime shape.

Regular meetings are being held and new members taken into the lately-formed New York State associations in Tompkins, Cortland and Cayuga counties. The following officers have been elected in Tompkins County: John Burns, President; Walter D. Helm, Vice-President; Seymour Grover, Secretary, and W. C. Cummings, Treasurer.

Organization of Cherokee County, Iowa.

The blacksmiths of Cherokee County, Iowa, recently organized themselves into an association, the object of which was to formulate and establish a uniform rate of prices, and to discuss matters of interest to the craft in general. The conditions which have prevailed for years in this neighborhood made the opportunity ripe for an association of this kind and the results have been highly satisfactory. This was accomplished with practically no ill-feeling on the part of their customers. All men of the craft in the towns of Marcus, Cleghorn, Meriden, Cherokee, Aurelia, Alta, Storm Lake, Quimby and Washta are members of the association, and as is characteristic of the craft, they are strictly



METHODS OF WELDING LOCOMOTIVE FRAMES.

maintaining prices on their word of honor. The following officers were elected: T. S. Brown, president; J. G. Reigel, vice-president; R. H. Kuhrts, secretary; Ed. Elfrink, treasurer.

The following is the list of prices which were adopted by this association:

Resetting shoes	$ .25
New Shoes	.50
Common bar shoes	.75
Steel plugged shoes, each	.60
Stable horses, resetting	.50
Stable horses, new	1.00
Neverslip shoes, new	.60
Neverslip calks	.05
Sharpening plow lay	.25
Sharpening plow lay and polishing	.50
Pointing, sharpening and polishing	1.00
Wing on lay	.50
Heel on landside	.50
New lay, 14-inch	3.50
New lay, 16-inch	4.00
New lay, 18-inch	4.50
Polishing plow and sharpening lay	1.50
Polishing plow only	1.25
Drawing roller coulter	.50
Grinding roller coulter	.50
Polishing roller coulter	.25
New landside plate	1.50
Drawing road grader blades	2.50
Polishing road grader mould boards	2.50
Axle stubs, single, ¾ to 1¼	2.50
Axle stubs, per set, ¾ to 1⅛	6.00
Axle stubs, per set, 1¼	7.00
Axle stubs, long distance, ¾ to 1¼	8.00
New buggy tires, ¾ to 1⅛, per set	5.00
New buggy tires, 1¼ to 1½, per set	6.00
Setting wagon tires, per set	2.00
Setting wagon tires, (bolted) per set	2.25
Setting wagon tires, (bolted), single	.60
New wagon tires, 1½ to ½, per set	7.00
Sharpening disc harrow, per disc	.20
Sharpening spading disc, 8-foot	5.00
Sharpening spading disc, 10-foot	6.00
Sharpening harrow teeth (when taken out and replaced	.02
Grinding cultivator shovels	.50
Drawing cultivator shovels	1.00
Trimming cultivator shovels	1.25
Pointing cultivator shovels	2.00
Polishing cultivator shovels	.50

Repairing Locomotive Frames of Cast Steel—1.

A. W. MCCASLIN.

The above subject should interest not only the foreman blacksmith, who, in a manner, is held responsible for the results or behavior of the work passing through his department, and the master mechanic, whose energy in determining the cause of failures frequently pushes the foreman dangerously close to the edge, or even the superintendent of motive power, who is inclined to pronounce the word failure, a corruption, or as being entirely void of meaning in its application to the performance of the motive power, but to all officials of all railroads, who have the best interests of their respective roads in mind; nor should we forget the traveling public, whose safety is, or should be, given paramount consideration from the highest official down to the apprentice boy in the shop. This is termed the steel age, owing to the fact that mild steel, through its superiority over iron for some purposes, has, to a material extent, superseded the latter. Steel is at the present time being quite extensively introduced, and one would think without a voucher as to its reliability, into one of the most expensive as well as fundamental parts of the locomotive. If compression, tensile and torsional strength were the only requisites of a perfect material for locomotive frames, steel would indeed be the ideal metal, but where shocks and vibrations are factors, we approach danger in its use. We know of no other member of the locomotive that is required to withstand, per square inch, that which is expected of the frame. Steel is not a universal metal, and can not be used indiscriminately or regardless of the laws governing metallography or metallurgy, but like men, should be chosen only to fill the positions best fitted for it. No thinking mechanic would accept a new locomotive frame made from crystallized iron, with its tendency to separate from the least shock. Steel is also "crystalline." We

doubt if there is a superintendent of motive power or a master mechanic on any of our railroads who would accept a new engine frame made from granular iron, with its disposition to fracture or separate, from shock, identical with that of crystallized iron when there is the least flaw or imperfection as to soundness of its surface. Steel is also granular, and every hole drilled into it makes its liability almost a certainty to fracture at that point, if subject to shocks. True steel has greater tensile strength than iron, but certainly at the expense of ductility. The best authorities on steel claim the highest tensile strength and greatest ductility cannot be had together. If it were possible to combine the highest tensile strength of steel, and the ductility of good fibrous iron, the problem of not only a proper, but the best material for frames and many other parts of locomotives, coaches, cars, etc., would be solved, and who could estimate the saving in dollars to railways in general, through the decrease in failures or breakages, frequently termed accidents?

In casting a locomotive steel frame, owing to its length and irregular shape, we believe it necessary to gate or pour the metal at several points; thus, in a manner casting it in sections. Does this metal retain the proper degree of temperature or fluidity, after traveling from four to six feet, as the case may be, to form a perfect union with the same metal at the same temperature from the next or neighboring pour? This would be possible when pouring large volumes of metal, if the pour be constant, but can we have perfect faith in the union of such metal when poured at intervals of four to six feet into a mould with a sectional area of only sixteen to twenty-five square inches, owing to its tendency to coldshut at point of supposed union?

Let us reason. If this metal be poured at the proper temperature to make a perfectly solid casting, retaining its full virtue as to specified strength, ductility, etc., what will be the percentage of these virtues at point of union, effected at a lower temperature occassioned by travel or metal through the mould some distance from the pour? Invariably it is necessary, when casting ingots, to cut from them what is called the piped end, which is constituted largely of the dirt and other impurities in the steel, which settles at top end of ingot. If this is necessary in order to procure a perfect or sound billet from which, through lamination, a solid bar or refined steel can be procured, what are the conditions of this metal in a steel frame with these imperfections and impurities uneliminated and distributed throughout the frame, the effects of which we fear are not always considered ?

If we have been observant we have noted, in the many broken steel castings that come into the shop, a cavity at point of breakage, around which can also be seen the impurities in the steel, which settled at that point. Nor should we be unmindful of the fact that the consequent ill-effects of all imperfections as to unions, as well as impurities in the steel, are greatly augmented by uneven contraction, which annealing does not always entirely relieve.

We know of no degree of temperature that a sectional area of twelve square inches at a much higher temperature will not more speedily meet or drop to than is possible with a sectional area of twenty-four square inches. If the argument be worthy of thought, I would ask: How can a long frame-back with a sectional area of twenty-five square inches cool or contract evenly with the braces or bottom rail with a section area to only one-half that of the back, without leaving a strain somewhere in the frame regardless of the method of annealing?

We are told by some men that castings made from open-hearth steel, containing a specified percentage of carbon, which is one of its life-giving components, do not run regular throughout as to points in carbon. Thus a frame made to specifications or formula, calling for thirty points in carbon, is liable to contain thirty points at one end, with twenty points at the other end and fifteen points in the middle, etc., which would make a frame of an unknown quality at any given point, with possibly its weakest section where greatest stress or abuse is to be met. I have been told by men who have straightened many steel frames under the steam hammer after they were annealed, that they sometimes break in two in the middle, by a blow from the hammer; others will break off near the end through shock or jar, which certainly shows feeble tenacity, but this should not surprise us when we understand that steel ingots sometimes crack in two or three places, even after they are supposed to be cold, which doubtless is due to internal as well as external strains, caused by uneven shrinkage, combined with the left-over impurities in the steel and through lack of reheating and the refining process under the hammer.

(To be continued.)

The Progressive Smith as a Business Man.—7.

Selling.

BILLY BUNTZ.

Some smiths have the idea that they have nothing to sell aside from the manual exertion they put forth in doing a job of work, yet the progressive smith knows it requires knack to handle his customers so as to make the most profit on their jobs; hence, he uses tact and spreads on a little "molasses," the same as the store salesman who endeavors to sell the best or highest-priced goods.

When a horse is brought in, instead of merely asking, "What kind of shoes?" he examines the hoof carefully—not particularly because he expects to find any deformities, but more especially to show the customer that he is giving the animal special attention. He may even have his helper run the horse up and down the street so he can see his gait,

remarking "It would be a shame to put cheap shoes on an animal like that!" Everybody likes to have his horse praised. If a customer can be induced by proper "horse talk" to buy the best shoes or special ones or have the hoof shaped by special tools, the smith increases his earnings; at the same time he need not be dishonest—simply *shrewd*.

From his familiarity with horses the smith often makes a good horse dealer, buying, trading or selling horses as an avocation; or he may be agent for miscellaneous supplies, such as tools, machinery, gas engines, harness, blankets, curative remedies, etc. Of course, the handling of such articles depends on the inclination of the smith, his location and the demand for such goods in his locality.

In selling, the shrewd smith is not prone to argue, but rather, he makes such statements of fact as he thinks seductive in inducing his customer to buy what he has to sell. When the customer talks on a certain point, he does likewise, rather than to appear disinterested or to insist upon getting in "side-talk" or mentioning some hobby. Where he knows his customer is in the wrong, instead of "flooring" him flatly, he states the facts in an offhand way as though he were passing the subject up, at the same time agreeing with his customer on a few points and complimenting him on his good judgment. As he talks, he notices the effect it has, and afterwards he *thinks* about it, so he can improve until he becomes an expert seller.

When he is doing a job repairing, he calls attention to the excellent quality of the iron, by showing how nicely it works under the hammer, or how well a sample stood the test of "bending over on itself," or how it stood a hard pull. "That iron," he remarks, "costs more, but the customer gets double benefit." Likewise, the customer comes to know that the charge will be higher, while the smith is afterwards praised for the good material he uses. Where a customer wants something cheap or is inclined to "Jew," he should be given to understand that although the job can be done, it can't be guaranteed.

When warranting a job, the shrewd smith does not say, "I guarantee" this, that or the other, for, even should he be positive it will last ten years, he takes into consideration that some customers would remember to bring the article back in nine years were anything wrong with it and want it renewed. A guarantee should be a general statement, as, what some customers say of jobs that have been done for them, or that the same article, with good care lasted one customer ten years.

When a job is brought back under the pretence that something was defective, the shrewd smith laughs and convinces the customer of negligence by saying, "That wood was given rough service to splinter that way," or, "Of course a wagon-box would warp, standing out this weather." "Can't expect varnish to hold gloss out in the wet." "That shoe was loosened by the car track." "That's no fracture in the iron, it's rough usage; you can break anything if its hit hard enough."

Bring in Your Tires!

Can set 'em quickly with my Setter, which compresses the metal cold.

No Burnt or Charred Felloes or Paint. No Shrinkage. No Over - Dishing. IN FACT—A PERFECT FIT.

In repairing old wagons or doing work where it would be impossible to have the repair last long, it is well to say, "Why didn't you bring me something easy? I can fix it as good as anybody, but it can't last." Should the smith deal in wagons, he should try to sell one to his customer, comparing the superior points of the new one with the "rattle-trap" and agreeing to take it in on a sale. He may substantiate any statements by showing manufacturers catalogues.

CLIPPING PARLOR

What Clipping Does for the Horse

Improves his appearance. Renders currying unnecessary. Prevents excessive perspiration or catching cold. Increases his vitality, strength and weight. Makes him cheerful — a better worker. Adds to his worth.

Bring Him In

To aid in making sales, where the shop has a large front window the smith may use the adjoining space for such exhibition purposes as clipping horses or showing his gas engine; or he may box off the lower half of the window or half its width for a show-case in which to exhibit a full line of horseshoes, or wooden hoofs poorly shod, with a placard entitled, "Why Some Horses Limp." Placards, posters, etc., are good advertisers. These can often be obtained of supply firms or manufacturers free of charge. A few sample placards are here shown in miniature. Selling or buying naturally refers to *contracts*, which will be dwelt upon in next issue of THE AMERICAN BLACKSMITH.

The Carriage Repairman.

BY SOMERVILLE.

The art of "Carriage Repairing" is more or less fascinating, because of the many different things that is required of the repairer; and to be a successful one "the man" must be a first class mechanic, must have a generous supply of patience and good-nature, be neat and tidy about his work; quick and resourceful, also.

I think that the man who has served his time faithfully at his trade, and has had the benefits of the experience of older heads, and has seen the different processes in forging that are needed for a carriage, makes the best man for a carriage repairer. He knows what to do. If a part of a carriage is wanted that he does not have in stock and can't conveniently get, he knows how to make it.

There are many jobs brought to the repair shop that are puzzling and take a lot of time to do. The customer may be in a hurry, he may not want to pay very much for his work. You don't want to lose him and you want a living price and a little more for your work. Or you may be overburdened with work. Everything is going wrong about the shop. Your fire doesn't work, and you have "the blues." Here is where your patience and good-nature comes in. Treat your friends well. Be good-natured and drive away "the blues."

The successful carriage repairer does his work neatly and I may say that it is just as easy to make your work neat and respectable as it is to make it rough.

Nobody really enjoys seeing a job of work "botched" or thrown from the anvil in a half-hearted way, as if the "smith" considered it a favor to do it at all. Work, to be appreciated, must be done thoroughly, and it is a true

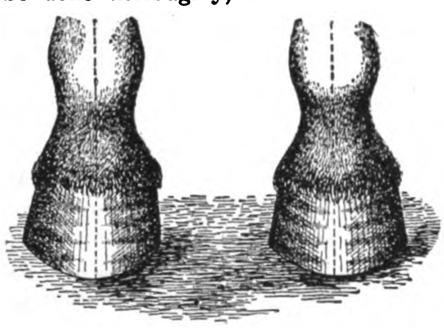


FIG. 2. FORE FEET, REGULAR POSITION.

saying that, "Anything worth doing is worth doing well."

As for stock, buy the best. Poor iron is the dearest thing you can buy in your business; you are never sure of it. You are always better satisfied when you know the work is going to stand, and the difference between good and bad stock is not worth running any risk for.

It is always best to keep ahead of your work; and as far as possible, finish one job before commencing another. Study the best way to handle your work so as to give best results; the man that is quick to see, and is resourceful, accomplishes more work with less labor than the don't-care fellow.

In these days of close competition it is advisable to have all the labor-saving machinery and tools that you can afford, such as punches, upsetters, blowers, etc., cold tire setter if you believe in them, and all your business will stand. A gas or gasoline engine or motor is a grand thing and I think the use of them depends a good deal on the business, and whether or not a "smith" can get his motor power cheap enough to warrant his buying. All those things tend to make the business a success and those within reach of them would do well to have them.

Don't be afraid to charge a good fair price for your work. You have got to do it if you want to be successful. Pay your bills and live decently. Give everybody an equivalent for their money, and when the bill is due, ask for it. How often do we see the man that is owing a "little bill" carrying his work to some one else just because he owes you. Make him pay that "little bill" and see how quick he will come back. Be a good collector if you can. I know that it is the hardest part of the business just now, but you can't get along without money. There are many good bright ideas to be gotten from THE AMERICAN BLACKSMITH that are of lasting value to the repairer; articles that are well-written and that would benefit the man that studies.

Judicious advertising is one of the most necessary things to make any business successful. It may take the form of an ad in the local paper, thereby keeping your name before the public, which I think is the best. There are many ways of advertising and it depends somewhat on the locality as to which would be the best way. Keep abreast of the times and the best way to do that is to take your trade journals and read them carefully, and the knowledge that the best of us can get from them may be applied with profit in our work.

A Treatise On Horseshoeing.—3.

JOHN W. ADAMS, V. M. D.

The Feet. Forms of Feet Viewed from in Front and in Profile.

Whether a horse's feet be observed from in front or from behind, their form corresponds to, or at least resembles, either that of the regular position (fig. 2), the base wide or toe-wide position (Fig. 3), or the base-narrow or toe narrow position (Fig. 4).

By the direction of the imaginary line passing through the long axes of the two pasterns (Figs. 2, 3, 4) we determine whether or not the hoof and pasterns stand in proper mutual relation.

In the regular standing position (Fig. 2) the foot axis runs straight downward and forward; in the base-wide position (Fig. 3) it runs obliquely downward and outward, and in the base-narrow position (Fig. 4) it runs obliquely downward and inward.

Viewing the foot in profile, we distinguish the regular position (Fig. 5*b*), and designate all forward deviation as acute-angled (long toe and low heel, Fig. 5*a*), and all deviations backward from the regular (steep toe and high heel, Fig. 5*c*) as steep-toed, or stumpy. When the body-weight is evenly distributed over all four limbs, the foot-axis should be straight; the long pastern, the short pastern, and wall at the toe should have the same slant.

A front hoof of the regular standing position.—The outer wall is a little more slanting and somewhat thicker than the inner. The lower border of the outer quarter describes the arc of a smaller circle—that is, is more sharply bent than the inner quarter. The weight falls near the center of the foot and is evenly distributed over the whole bottom of the hoof. The toe forms an angle with the ground of 45° to 50° and is parallel to the direction of the long pastern. The toe points straight ahead, and when the horse is moving forward in a straight line the hoofs are picked up and carried forward in a line parallel to the middle line of the body, and are set down flat. Coming straight toward the observer the hoofs seem to rise and fall perpendicularly.

A hoof of the base-wide position.—This is always awry. The outer wall is more slanting, longer, and thicker than the inner, the outer quarter more curved than the inner, and the outer half of the sole wider than the inner. The weight falls largely into the inner half of the hoof. In motion the hoof is moved in a circle. From its position on the ground it breaks over the inner toe, is carried forward and inward close to the supporting leg, thence forward and outward to the ground, which the hoof meets first with the outer toe. Horses that are toe-wide ("splay-footed"—toes turned outward) show all these peculiarities of hoof-form and hoof-flight to a still more marked degree and are therefore more prone to "interfere" when in motion.

A hoof of the base-narrow position.—This also is awry, but not to so marked a degree as the base-wide hoof. The inner wall is usually a little more slanting than the outer, the inner half of the sole wider than the outer, and the inner quarter more curved than the outer. The outer quarter is often flattened and drawn in at the bottom. The weight falls largely into the outer half of the hoof. In motion the hoof breaks over the outer toe, is carried forward and outward at some distance from the supporting leg, thence forward and inward to the ground, which it generally meets with the outer toe. The

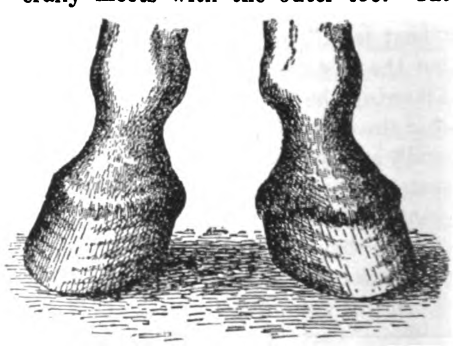


FIG. 3. TOE WIDE POSITION.

foot thus moves in a circle whose convexity is outward, a manner of flight called "paddling." A base-narrow horse whose toes point straight ahead frequently "interferes," while a toe-narrow (pigeon-toed) animal seldom or very infrequently does so.

Regular hoof.—A regular hoof (fig. 5*b*), viewed from one side, has a straight foot-axis inclined to the horizon at an angle of 45° to 50°. The weight falls near the center of the foot and there is moderate expansion of the quarters.

Acute-angled hoof.—An acute-angled hoof (fig. 5*a*) has a straight foot-axis inclined at an angle less than 45° to the horizon. The weight falls more largely in the back half of the hoof and there is greater length of hoof in contact with the ground and greater expansion of the heels than in the regular hoof.

Upright, or stumpy, hoof.—In the upright, or stumpy, hoof (fig. 5*c*) the foot-axis is straight and more than 55° steep. The hoof is relatively short from toe to heel, the weight falls farther forward, and there is less expansion of the heels than in the regular hoof.

Wide and narrow hoofs.—Finally, there are wide hoofs and narrow hoofs, dependent solely upon race and breeding. The wide hoof is almost circular on the ground surface, the sole but little concave, the frog large, and the quality of the horn coarse. The narrow hoof has a strongly "cupped" sole, a small frog, nearly perpendicular side walls, and fine-grained, tough horn.

Hind hoofs.—Hind hoofs are influenced in shape by different directions of their pasterns much as front feet are. A hind hoof is not round at the toe as a front hoof is, but is more pointed. Its greatest width is two-thirds of the way back from toe to heel, the sole is more concave, the heels relatively wider, and the toe about 10° steeper than in front hoofs.

(To be continued.)

The Practical Scientific Treatment of Interfering Horses.—5.

Cross Firing.

E. W. PERRIN.

Cross firing is a phase of interfering peculiar to fast roadsters, especially pacers, or trotters that "mix"—change their gait. It often happens when a horse is driven to a break. Cross firing consists in the animal striking the inside heel or quarter of one front foot with the inside toe of the opposite hind foot, sometimes causing a severe wound on the coronet, while occasionally the sudden interruption of locomotion resulting from the blow causes the animal to fall violently to the ground.

The passing gaited trotter does not cross fire, because his hind feet straddle the front tones. The line trotter—the horse's whole hind feet follow directly over the track of the front ones—does not cross fire, unless driven to a break or in changing.

Causes.

The discovery of the cause is the all-important factor in the treatment, for if you are not sure of the cause of the trouble, then all your remedies are mere haphazard guess work. The proper fitting of the harness and hitching to the sulky have much to do with it. For instance an ill-fitting breast collar may impede the motion of the fore extremity—the shoulders—while you sit behind the horse with a whip urging him on, and may cause the hind quarters to move too fast for the front ones. A bit that hurts the mouth may cause like results. Urging the horse beyond his speed with a whip is a common cause. A horse may improve considerably on his record, for speed, but these improvements are to be achieved by the slow process of careful training. Any soreness in the front legs or feet may sufficiently impede the "pick-up" of the front feet, as to leave them in the way of the hind ones. Lastly, improper shoeing is a cause of cross firing, and under the head of shoeing, I would lay special stress on the preparation of the feet; most pacers are outside wearers behind and go better shod a little heavier behind than in front. However, there are a few exceptions to this rule.

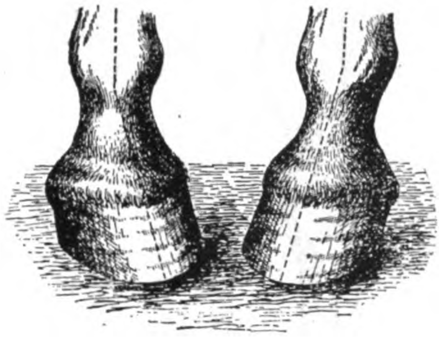


FIG. 4. TOE NARROW POSITION.

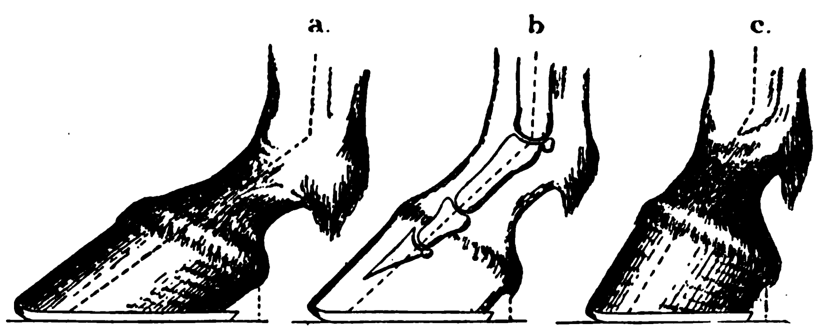


FIG. 5. FORMS OF FEET VIEWED IN PROFILE, SHOWING DIFFERENT POSITIONS.

Treatment.

If you conclude that the shoeing is at fault, first take particular notice of the wear of the front shoes; also observe the angle of the front feet, to see if they conform to the angle of the pastern. Remember that the short upright pastern has an upright foot somewhat high at the heels, and hence if you let the toes of such feet grow abnormally long, you not only put too much tension on the flexor tendons of the leg, but you impede the "pickup" of the front feet which of itself is enough to cause the trouble. If the old shoes show that the "break-over" is at the outside quarter, then roll the shoe at that part.

Now about the hind feet,—it will invariably be found that in horses that cross fire, the inside hoofs are too high. If you find this to be the case, lower the inside of the hoof especially at the toe, as much as it will stand without injury, and use shoe, Fig. 12A. This shoe is designed to give the foot more ground surface to the outside, the extra width on the outside being fitted wide of the foot. If the outside of the foot is wide, then use shoe B, the flange shoe. The weight of the shoes must depend on the horse, and the kind of work for which he is to be used, but in all cases the shoes should be no heavier than is compatible with a reasonable amount of wear. If the front feet are hard and dry, poultice them with warm wet bran for a few days, or stand the horse in a wet clay stall during the day, and remove him to a dry stall with bedding at night. If you are in doubt as to the proper angle of the feet, use the horse a few days without shoes on soft ground until he has worn the ground surface of the hoof to the shape that suits his conformation and mode of going, taking care not to let him wear his feet sore. Then if he goes clear, as he invariably will, provided, of course, that defective shoeing was the cause, shoe him with a light plate all around, the same weight on each foot, bending the plate onto the ground surface of the hoof. If he goes clear with his feet worn in some peculiar shape, don't imagine that you can improve on it by rasping the hoof to some shape suitable to your eye. If he goes clear, that is all sufficient, never mind because one foot is high on the inside while its fellow is high on the out. Practical experience is the best teacher. I have two cases of this character in my practical shoeing today—one goes clear with a front foot

high on the outside and its fellow high on the inside, while the other goes clear by treating the hind feet in the same manner. Such cases are few and far between

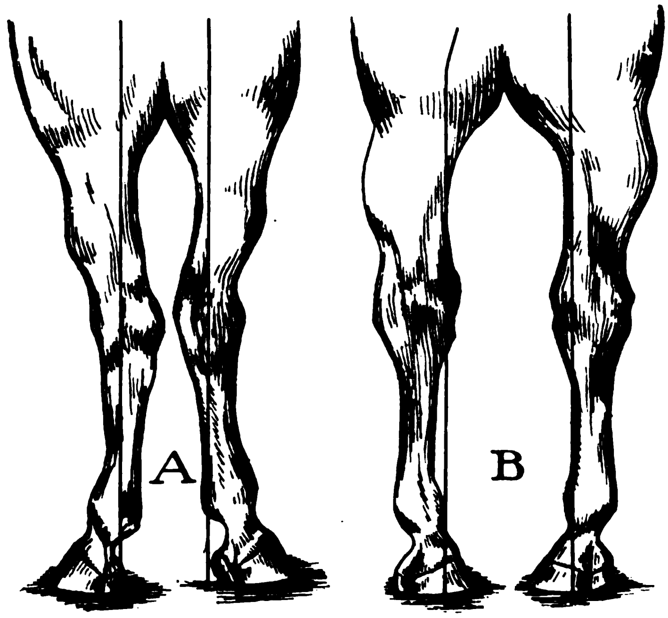


FIG. 11. A, THE COW HOCKED HORSE. B, A CONFORMATION VERY PRONE TO CROSS-FIRE.

and result from some peculiarity of conformation. This defect may be very slight, and very hard even for the experienced eye to detect, but it is there, nevertheless. I have had no trouble with the two cases I speak of since I discovered the real cause of the interfering. Recently, however, one of my men was sick, and I had a stranger in his place and one of these horses came to be shod while I was out of the shop. The new man "leveled up" his feet as he called it, and the next day the horse came back interfering, so that I had to make up the

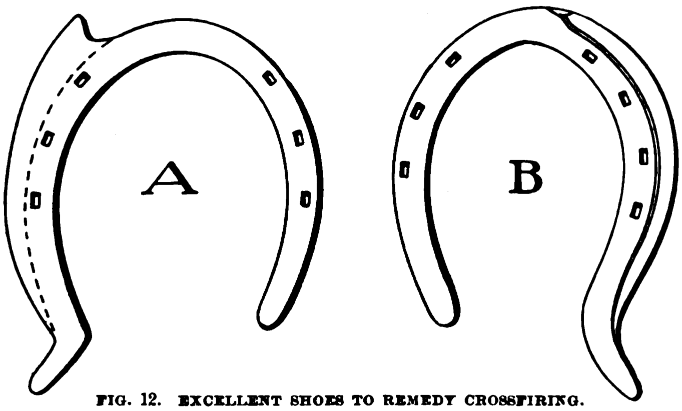


FIG. 12. EXCELLENT SHOES TO REMEDY CROSSFIRING.

amount of hoof rasped away with layers of leather so as to restore nature's level, and then he travelled all right again, thus giving me another proof that the ground surface of the hoof must conform to the limb. Cross-firing is a form of interfering that does not affect slow horses, and much depends on the trainer or driver. Of course, if the driver will persist in pushing his horse above that speed at which he is capable of moving his four limbs in unison with each other, the result is a break, a "mix up," and this is one of the ways that a horse is made to cross-fire. I need hardly say that the horseshoer cannot remedy cross firing when it results from that cause.

In treating interfering, it behooves the shoer to look carefully into all the possible causes. It will sometimes be found to be caused by things that seem to have no connection. But it is certain that every effect must have a cause, and it is the cause which must be sought in every case before a cure can be effected.

(To be continued.)

A Home-made Tuyere Iron.

FRED RICKERT.

I have read about all kinds of tuyere irons, and will here tell about the one which I am now using. I have used all kinds, but think the one which I now have the best, and it cost me but ten cents and ten minutes' work. It is a two-inch gas pipe with elbow in the center. It has three ½-inch holes drilled in the elbow and pieces cut out between the holes as shown in the drawing. My fire will keep clean as long as the other two fires in our shop, and do as much work and heat quicker than my partner's, who has a $3.00 tuyere iron, and when iron or steel will not weld in his fire, it will weld in mine. Recently I welded a wagon tire in my fire which he could not weld, and he is a good man to take a heat.

Prices in McKean County, Pennsylvania.

CHAS. PHALON.

I would like to give some of McKean County prices. They used to be ten and twenty, or twelve and a half and twenty-five cents, but we got together and now have the following prices:

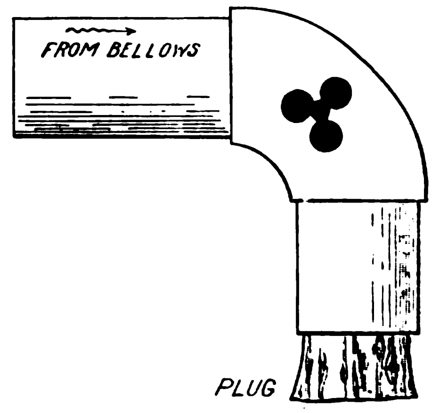
Shoeing	$ .20 and .40
Shoeing, No. 7	.25 and .50
All handwork	.25 and .50
Bar shoes, per pair	1.50 to 2.00
Neck yokes	2.50 to 3.50
Whiffletrees	2.50 to 3.00
Links	.10
Claw hooks	.40
Swivel clevis	1.50 to 2.00
Axles	3.00
Tongues	2.50
Buggy tire setting	.60
Tires, 3 inches and up	1.00
Narrow wagon tire, per set	2.00

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Who Makes White Rock Hoof Packing? Can any of our readers tell us?

Will Someone please give me the following information through these columns,—which is the best way to temper buggy springs after they are welded? I do considerable such work. CHAS. E. OEHMB.



A HOME-MADE TUYERE IRON.

Hardening Concave Steel—I would like to know the best way to case-harden a concave shell made out of malleable iron, which is very thin, so that it will not crack. Who can tell me? L. M. EMIG.

Blueing Steel—Will some one tell me how to blue steel, like a blue pistol? I can blue it, but it doesn't last long. I especially want to know how to blue bridle bits or spurs and such things. R. B. THOMPSON.

Cold Tire Setters—Will some brother smith kindly inform me through THE AMERICAN BLACKSMITH which is the best kind of a hand-power cold tire setter that will set tires up to 2½ by ⅝ inches, together with the cost of the same. SUBSCRIBER.

Oak Graining—I would like to know how to do graining, especially oak graining. Can some one tell? G. E. B.

Whiffletree Staples—Can some brother blacksmith tell me who makes steel drop forged whiffletree staples, with large eye, 3½ or 4 inches in diameter? L. F. CADNE.

Tempering a Gaff—Replying to Mr. White in the February issue, it seems to me I should draw the temper to a fairly good yellow. I have never made any gaffs, but this is how I would temper one if I did.
H. C. ARTER.

A Tinning Query—What I want to know is how to prepare malleable iron castings to tin them, and what proportion of tin and other white metals I should use. Also what kind of vessel for melting the metal in, to dip the castings. I make the Eclipse neck-yoke center and have a call for it tinned as well as japanned. Muriatic acid is used for cleaning the castings with.
S. J. McDONALD.

A Question on Axes—Will some one tell me regarding the making, hammering and tempering of axes? I would like to see something on this subject, as this work is quite a trade here in New Brunswick. What is the best brand of steel to use and the proper hardness to temper? R. MOORE.

Pulling Spokes—My way of pulling spokes out of a hub, in answer to T. E. Laison, is to make a link out of ½-inch round iron, large enough at the bottom to go over the spoke. Then make a wedge-shaped piece of iron, put it in ring on the top of spoke and drive with hammer. This will draw spoke without breaking it. H. B. PROSE.

Drilling Chilled Cast Iron—In reply to the question asked as to how to drill chilled cast iron, I have found that camphor gum and turpentine is an excellent preparation for drilling hard tempered steel and I have no doubt it will have the same effect on cast iron. I have drilled steel with this preparation that I could not drill with oil.
DONALD A. McDOUGALL.

Barcus Horse Stocks—In reply to Mr. W. W. Herring's question about the Barcus Horse Stocks would say that I have one and shoe the most vicious kind of mules, some of them weighing 1,400. I do not think there is another set of stocks made that is their equal. They are very easy to work and safe for both man and beast, and I recommend them very highly. JOHN MULL.

Mr. Metcalf's Shoe—In reply to Mr. Metcalf, will say that the shoe which he makes is very good and will spread any foot. I have used them for a long time, but the better you breed a horse the more apt he is to contract. If you spread him too quickly, he is apt to become very lame. It is a hard matter to explain to some men the reason, so the next best thing is to put on a pair of toe tips. This will let the horse's toe grow out and will spread the quarters. A good plan is to let the horse run out in the dew and keep the foot soft. This will be beneficial. GEO. D. ALBERTSON.

Making Punches—Replying to the question of Mr. T. Rowan in the December issue, I would say that blacksmiths' punches should be made out of steel of from 80 to 90 points carbon. In dressing to shape, be careful not to overheat. Draw to a brown yellow. The punch should taper down slightly, with a quicker taper at the extreme end. Where the plates to be punched are of the same thickness, I find a guide plate useful. It is formed of two plates riveted together, wide enough apart to insert the piece to be punched, and having holes formed in them to guide the punch. B. B.

Keep at it—Replying to the request of Mr. J. J. Mullen, who asked for advice in the February issue, I would say by all means stick to the shop. I would charge good prices, and do good work for the price. There is bound to be more or less competition everywhere, and a young man has got to go through more or less of a struggle to establish himself. Don't think of giving up the shop because business is poor. Try to get the reputation of being the best mechanic in the neighborhood. To do this, strive to do your work as well as possible. Finish it neatly, and never lower yourself by charging too low a price. Treat your customers well, give them their money's worth, be progressive, and you will find there's no need to think of quitting, as business will increase. W. B. ASH.

Pointing Old Plows—In reply to the inquiry as to how to point old plows, would say that I take and heat the point for two or three inches, cut the share off, leaving the bar. Draw the bar just like a new one. Make your point to taper to fit the bar at the small end and widen to fit the space you cut off the share. Weld on the bar first, then the share and your job is done. P. D. M.

Setting Tires—In answer to John G. on setting tires will say that the way to set them hot (the old way), is to be sure that all the slack is taken out of the wheel, *i. e.*, have

SHOP OF C. A. HEATH.

the spokes tight in the hub and the rim, being careful in measuring the rim and tire. But the better plan is to get a Brooks Tire Setter and set them cold. Then one can see just the amount of dish as it is drawn. JOHN H.

Axle Form—In the March issue was published a draft of an axle form which I sent in. Since that time I have noticed the inquiry of Mr. Blanchard. He mentions arched axles, and the thought struck me that since the top side of the axle is always turned to the form, I ought to have mentioned it. For an arched axle, the curvature of the form should be the reverse to one for drop axles, that is, the center should be lower than at the ends.
NELS PETERSON.

A Short Shop Letter—I am very much pleased with THE AMERICAN BLACKSMITH—don't stop it as long as I am in business. I set 500 shoes from Dec. 1st to Dec. 24th, or for shoeing alone $83.63, and since then it has been more icy than ever. Accompanying this is a picture of my shop (which is 18 by 36) taken from the shoeing floor. The shop is operated by a 4-horse power steam engine with the little boiler back of the forge. I have a grind stone, drill, tenoning machine, wood and iron lathe, jig saw, emery stand, a rip and cross-cut saw and jointer all on the same shaft, and a foot-power hammer, all of my own make. I believe in tools. C. A. HEATH.

Tinting Ceilings-Selling Inventions—Will some one please let me know how to paint or tint ceilings, what colors are best and how to mix them? I should also like to know how to dispose of a couple of inventions I have. I have not got them patented, nor do I wish to go to the trouble. The one is a spoke-measuring device. When you know the size of hub and wheel, the machine can be set instantly to the length spoke required. The other invention is a trace holder for sword singletrees. If some one will answer these questions I shall be greatly obliged.
G. E. BRIERLY, Arva, Ontario.

A Shoe for Cripples—I have made three different boots, or iron shoes, as they are called, for cripples. Take a steel bar three-sixteenths by one-half inch, and make it in shape of bottom of the shoe with the offset for heel. The posts are to be flattened to cover about the size of heel. These, welded to the heel and toe, should stand up to rest under the heel and ball of the foot, just back of the toes. Put three holes in each plate, fasten on with short screws, the hind plate to extend forward and the front backward. The bottom of the shoe should be made oval, the same as the sole of the shoe. H. B. PROSE.

Gun Springs—For the benefit of a reader of your valuable paper, in regard to nature—Let him make his spring, finish it, then about dark, over a small fire, with a low blast, let him heat it evenly, till it becomes a deep red, then plunge it sidewise into a kettle of water, with the chill heated off. Soft water is the best. Then heat it again over the fire, occasionally holding in a dark place till he sees the red, not as high as the first. Then you have got a temper in a spring that can't be beaten. I have done a good deal of gun-smithing in my days, and this was my way of tempering for a spring. An old tramp taught me this for twenty-five cents. A. S. OTTEY.

Resetting Tires—In answer to John G. with regard to resetting tires, I don't think any one can answer his query. I have had a third of a century's experience and find that the smith has to use judgment in this work. In the first place, wheels vary so much that there can be no fixed rule for setting the tires. A light wheel will not stand as much draw as a heavy wheel, and if a wheel has dish you will have to give it less draw than one that is straight. If a tire is light and badly worn out, it will set closer to the wheel than a thick one, so you can give it more draft. A larger wheel needs more draft or surface than a small one, so that you will see that hardly two wheels would require the same draft to the tire. MONROE HUBBARD.

Tire Setting—In answer to Mr. John G. in regard to tire setting, will state that no rule or set of rules will apply to all wheels. Suppose you have a new wheel, spokes all driven tightly in the hub and felloes well set on the shoulder of spoke tenons and joints in the rim close jointed. With one joint one-eighth inch open to prevent rim binding, give your tire three-eighths inch drawn and you will have your tire tight and the proper dish in the wheels, if the spokes have been properly driven. But if you have a very old loose wheel, you must use judgment, according to the firmness or looseness of your wheel. If the rim is loose, wedge up and cut the tenons of the spokes a little below the surface of the rim, so the tire won't rest directly on them, as that will surely spring the spokes and dish the wheels. M. A. FOSTER.
Echo Lake, N. J.

Mixing Paints—In reply to "A Reader" in the February issue who asks for information relative to mixing paints, would say that such information would extend beyond the limits reserved for a single article in The American Blacksmith. If he will procure a copy of "Practical Carriage and Wagon Painting" advertised by The American Blacksmith, he will find 17 pages devoted to colors, mixing, application, etc. To obtain a good job of wine color painting, light shade—wine color is furnished in three shades—bring up the surface in the usual way, then apply a coat of Indian red, the coat mixed to dry flat, next add enough wine color to varnish to stain thoroughly and apply as a color and varnish coat. A nice wine color will result. therefrom. M. C. Hillick.

Gasoline Engines—I saw in The American Blacksmith an inquiry about gasoline engines. I will say that I use an Indian Motocycle. This machine cannot only be used for pleasure on the road, but I bring it into the shop, place it on a stand, which I made myself, and I run a No. 7 Champion drill, a grind stone, and horse clipper, and have plenty of power left. I also intend to get a lathe to run with this motor. I find them very easy to gear for running any kind of machinery. I have these Indian Motocycles for sale and will send catalogue upon application. Full particulars as to how to gear them is given with each purchase. Thus you see you not only have power for the shop, but also a bicycle for pleasure. I have won races with this machine and consider it as good as an ordinary gasoline engine for the same price. J. Marion,

Mixing Paints—I give the following in answer to the question of "A Reader." They are to be mixed in proportion to the shade desired.

Buff—white, yellow ochre and red.

Chesmit—red, black and yellow.

Chocolate—Indian red, vegetable black and pale chrome.

Claret—red, umber and black.

Drab—white lead, umber and Venetian red.

Flesh—white, yellow ochre and vermilion.

French Grey—white lead, Prussian blue tinged with vermilion.

Silver Grey—white lead, Prussian blue, small portion vegetable black.

Gold—white lead, middle chrome, burnt sienna.

Violet—red, blue, white.

Rose—white, Madder lake.

Salmon—white, Venetian red and yellow.

Copper—red, yellow and black.

Peach—white and vermilion.

Plum—white, blue, red.

Cream—white lead, chrome yellow, Venetian red.

Fawn—white lead, ochre, burnt sienna.

Carnation—white lead and red lake.

Dark Brown—Indian red and drop black.

Wine Brown—Indian red, Prussian blue, little chrome yellow.

Olive—yellow, blue, black and white.

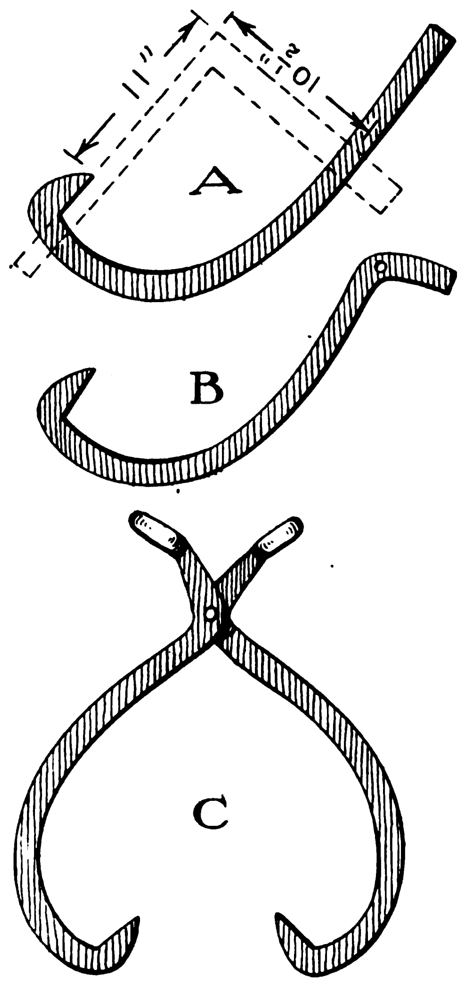
Grass Green—Prussian blue and chrome yellow.

Cheap Green—yellow ochre and vegetable black.

Wine Color—carmine and ultramarine blue. G. E. B

Hardware Dealers—If there is a jobbing house in this country doing a good business with the country shops, should not the said country shops have some way to get back at the aforesaid jobbing house when the latter, doing a "cash in advance" business, sends the blacksmith a grade of goods so much below what is represented that they are worthless for the particular job for which it was ordered, thereby entailing delay and worry on the part of the smith in the country? He at present has no way of redress, unless he can get it through some paper, where he can warn his brethren against the swindlers.

On last 19th of October, I paid for a set of good wheels, C grade, standard pattern, Sarven patent wheels, tired, in the white. The wheels came covered with a coat of white lead, all the tires loose, three of them burned in the welding, and all of them more crooked at the weld than any tire I ever before saw, although the firm claims to have facilities for straightening tires after welding. This is claimed in their catalogue,



HOME MADE, SERVICEABLE ICE TONGS.

misleading the smith to believe that the tires will be straightened after welding, although no such thing is done, however. I promptly returned the wheels, and through one excuse or another the wheels did not get back to me until February 10th, lacking just nine days of being four months since the wheels were paid for.

This being my first order with that firm, I of course sent the money with order. It is scarcely necessary to say it will be my last. Richard O'Hearn.

Ice Tongs—In answer to the request of Mr. J. F. Semple as to how to make ice tongs, the following is my method, which is satisfactory to every one of my customers. I take 26 inches of mild steel, seven-eighths or one inch wide and three-eighths or seven-sixteenths thick, according to the weight of the tongs which I desire to make, and forge as follows:

First, I turn the head in over edgeways and draw to a flat or chisel point. I then measure 19 inches from the inside of the head and make a center mark where the hole will be, bending the pieces so that they will look as at *A*.

The two pieces, for there must be two jaws, should be shaped so that when you lay a square on them, in line with the inside of the head, it will be just eleven inches to the corner of the square from point of tongs and 10½ inches to center of the bar at the center mark. The greatest bend should be about from four to eight inches from the hole. This will give a better chance to get down on the cake of ice. Next bend back at the mark so that it will look as at *B*.

I then weld the handles and punch or drill the holes. I use a small punch and stretch the hole to about three-eighths or 7/16 of an inch. The handles I make out of ½ or 5/8 inch round iron, bending and welding together. The distance between the handles and the hole should not be more than six or seven inches after they are welded on. The handles should bend back a little, as at *C*, so as to give room for a man's fingers without jamming together. Peter H. St. Louis.

Tempering Gun Springs—In answer to J. Summs as to the mode of tempering gun main springs, will say that I have had fifteen years' experience and find that the best spring which I ever made was with a plain oil temper. He speaks of a cherry red heat and dipping in some chemical bath, but I have heard that these same springs break. The way I do it is to select a good piece of spring steel, not cast steel, as that is too hard. A piece of an old cross-cut saw does very well. Clean out your fire, burn your coal to coke and be sure that the sulphur is all out of the coal. Heat the spring to a light red and forge to shape. File or grind it smooth lengthwise with the grain of the steel, taking care that the grain is straight. Don't file or grind across it, as that will score it and cause a break. Have the spring of a gradual taper, perfectly true. Round off the square corners to lessen the danger of fire cracks, and it is ready for the temper.

To temper the spring heat to a dark red, dip in sperm or good lard oil, edgeways. Allow it to cool and then take out with a wire. Hold it over the fire until the oil burns off a number of times or until a small blue flame about an inch high stands, flickers and goes out. Now drop in a dish that has oil enough to cover it, about four tablespoonfuls; set it on the fire, and leave until oil is all out. Turn the spring on the ashes of the forge to cool and you will have a spring that will do its part, if you have done yours. E. C. Johnson.

The Gather of Axles—In reply to Mr. Nels Peterson, I will state that we haven't much grounds for an argument, although this is the first time that I ever knew of a factory turning out jobs of any kind of vehicles, without any gather on the axles. Mr. Peterson's explanation of the pitch of spindle, which gives the wheel a plumb spoke, is correct without a doubt, but that is quite different from the gather, if the axle is perfectly straight. The wheels will measure the same in front as at the rear. Now, if the wheel is on a plumb spoke it will play equally between shoulder and nut, while the axle is new, but after it is worn, if you will notice you will observe that the wheels begin to run to the nut, and certainly that will cause friction. Now, if you will take a job that is considerably worn, on which the axles have no gather,

and measure them, you will find they are wider in front than at the rear. That explains the necessity of gather. Then after the spindle becomes worn, the wheels stand about the same in front as at the rear. I am quite sure here in the War Department, if we did not give the axles any gather, we could not hold our position. I think you can see clearly that a worn job needs gather. I served an apprenticeship in a factory in Burlington, where we built both light and heavy jobs, and all axles were given gather according to the height of wheels. My opinion is, for a three-foot, eight-inch wheel, it should stand one-half inch closer in front than at the rear. M. A. Foster.

A Kansas Letter—Not having seen anything printed from our part of Kansas, I will give a few facts about the work in this vicinity. Abilene is a town of about a population of 4,000 and the work consists principally of horseshoeing and carriage work. However, we are prepared to meet anything that comes along. In this section there is a large number of creamery stations, every one of which has attached a so-called blacksmith shop. They do most of the heavy, rough work very cheap and are welcome to it. This has been an open winter and we have enjoyed a very nice run of work. Prices are none the best, but we try to get a reasonable remuneration for our labor The following are a few of our prices:

Tire setting, buggy and wagon wheels, up to 2-inch	$ 2.00
Spokes, single	.25
Spokes, more than six in one wheel,	.20
Felloes	.25
Half-rim for buggy or spring wagon	.75
Shaft, one coat paint	1.25
Shaft, finished, painted	1.75
Buggy and spring wagon poles	2.50
Buggy and spring wagon poles, finished painted	3.00
Wagon tongues, oak	2.75
Wagon tongues, ash	3.00
Wagon axles	3.50
Painting	8.00 to 20.00
Side curtains, 28 oz. drill	2.50
Side curtains, 28 oz. duck	3.00
Bow sockets, single	.75
Horseshoeing—factory shoes plain, per pair	.75
Bar shoes, per pair	1.00
Hand turned shoes, plain	1.00
Hand turned shoes, weights	1.25 to 2.00

We consider that we have one of the best horseshoeing shops west of the Missouri river. H. A. Lott.

To Make Dividers—I notice the query in March issue of The American Blacksmith by Thos. Long with regards to making dividers. About the quickest and perhaps the best way to make a pair of blacksmith's dividers is to take a stump joint. You then have the knuckle already made, cut down with file or on emery wheel, as indicated by dotted lines in figure at *a* and *a'*, as it is difficult to forge close to knuckle without getting it out of shape. Then spread joint till straight, and forge to shape as shown at *b*, *b*. Make a thin flat punch and punch holes equal distances from knuckle, as shown at *c*. Having this done you can weld pieces of steel on, say axle steel, at *d*, and draw to taper the desired length. Then drill a three-sixteenths inch hole through shank at *e*, for rivet, and another hole about one-eighth inch, at *f*. Cut thread through same. This hole should be drilled clear through, as it would be difficult to cut thread without running the tape through the entire thickness; you would also have the advantage of using either side for set screw. Then make the bar *g* about three-eighths inch wide by one-eighth inch thick, and bend it slightly, not necessarily to a true semi-circle, as the joint at *e* allows it to adjust itself to the spread of the compasses. The set-screw *h*, should be made of soft steel, tire steel will do, three-sixteenths inch, with a flat head, for tightening up when setting compass. I made one in this manner about ten years ago, and it is as good today as when new, and it has seen some extremely rough usage, too Nels Peterson.

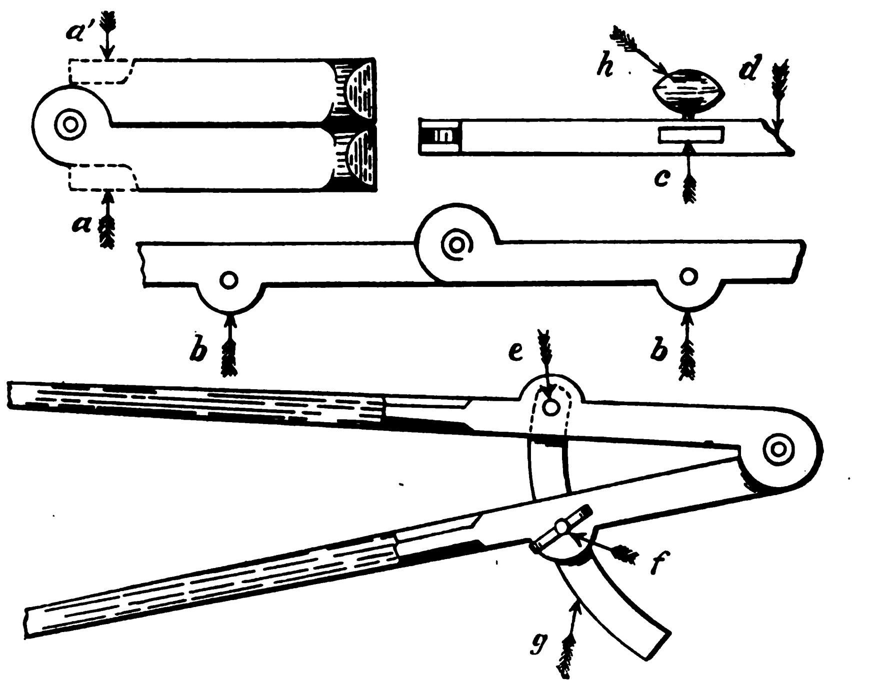
An Interesting Letter from Colorado—I have been a subscriber to The American Blacksmith for the last two years and find it a great help to me. I have been at the trade for thirty-two years and have yet much to learn. I have made a study of horseshoeing for over twenty-five years and find that a shoe that will cure one horse will not suit another for the same fault. I think the Essex Rubber Pad is of great benefit out here where you can find corns on horses' feet that have never worn a shoe. Sometimes a bar shoe is of benefit, but more often I find for all troubles, a foot trimmed level and shod with a plain shoe fitted properly to the foot, will prevent or overcome interfering nearly as often as if fitted with these new-fangled shoes which do not fit the foot. Some of our prices are as follows:

Horseshoeing—	
No. 0 to No. 3, per set	$ 1.75
No. 4 up, per set	2.00
Hand turned shoes	2.50
Bar shoes, per pair	1.50
Buggy tires, per set of four	3.00
Wagon tires, each	1.00
Steel plow points, each	.25 to .50
New tires, per set, $\frac{7}{8}$ x $\frac{1}{2}$	8.00
New tires, per set, $1\frac{1}{4}$ x $\frac{3}{8}$	10.00
New tires, larger than above, extra per set	2.00
Axle stubs, per set	10.00, 12.00 14.00
Single buggy shafts	2.00
Cross bars	1.50 & 1.75
Singletrees	.75 & 1.00
Express shaft	2.50
Wooden axles, each	4.00 to 5.50
Bolster, front, wood, each	3.00
Bolster, hind, wood, each	2.50

I have three men working in my shop besides myself. In January we set 150 tires, and in February up to the 20th, 134. We also do a great deal of rubber tire work, using a Morgan & Wright latest improved machine, which we find a very good machine for the work. If there is a better one, I would like to hear of it.

I am also very much interested in the Lien Law and trust that we may soon have such a law in Colorado. I also hope that the time will soon come when every blacksmith, wheelright, and horseshoer will have to stand an examination and have a diploma in order to start a shop, or even to work in one. Then the craft could get prices for their work on which they could live as they should A. M. McGeary.

Tire Query Answered—John G. desires to know how much draw he should give a tire in resetting. This depends on the condition of the wheel, as to whether it is perfectly dry and the hub is sound. Old wheels with soft hubs and a good deal of moisture need more draw to get the wheel in good condition than a dry one. There is no particular rule and the smith has to depend upon his own judgment.

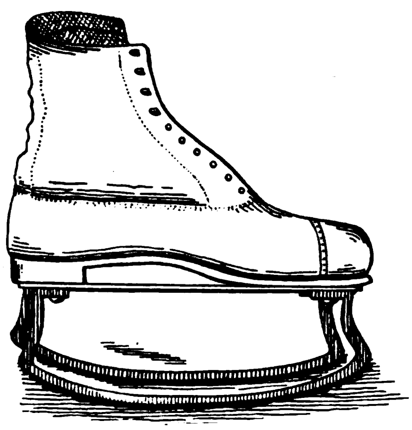


METHOD OF MAKING A PAIR OF BLACKSMITH'S DIVIDERS.

We will, however, assume that a wheel is dry and rim-bound. Saw through the rim in one joint, and then in the other to keep the wheel round, and drive the rim down on the spokes with a very light hammer. Saw the rim till it is open about three-thirty-seconds inch, and put in a little wedge to keep open. Measure from this point around the wheel to the other edge of joint, upset the tire to the right of the joint holes on one side, and to the left of the joint holes on the other, thus bringing the bolt holes in the tire to correspond to the holes in the rim. Roll the tire if you have upset a little too much, draw out a little of it, having the tire measure just the same size as the wheel, allowing what heat there is in your two upsets for the draw, which is generally about three-thirty-seconds of an inch or what you sawed out. This is for carriage and buggy wheels. The more you saw out of the rim, the more dish you will have. I have set express wheels that wore out the tire without resetting, using this rule. Most wheels are strained by setting the tire too tight. Don't roll the wheel in a trough to cool tire, as this draws one side too quickly.

Set it up and let it cool, after which burn out the bolt holes a little and bolt up. When the tire is the same size as the wheel, there is drawn enough for a new wheel. Express and heavy truck wheels need more. Try it. E. C. Johnson.

Iron Boot for Cripple—I made an iron boot, or stool as I called it, for a young man, that I think will answer Mr. Semple's purpose. It was adjusted on the sole of



IRON BOOT FOR CRIPPLE.

the shoe with small screws. I took an old handsaw blade and cut out a piece the size and shape of the sole and heel of the shoe, and fitted it to the sole. Taking two pieces of one-quarter inch tool steel, I bent and riveted them to the sole piece as shown. Peter H. St. Louis.

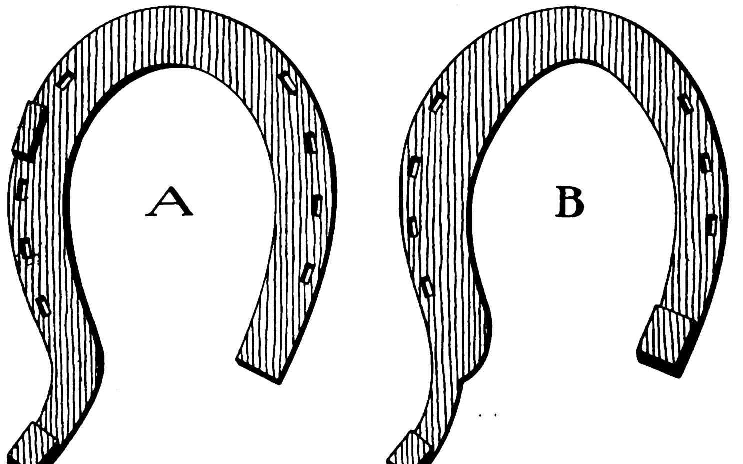
Organizations of Blacksmiths—I have seen much about organized blacksmiths to regulate prices. I make a fair price on everything, guarantee the best work in the shortest time, regardless of the other fellow, and if my price does not suit, the customer can go to the cheap man, which he sometimes does. But as he only causes a breakdown somewhere else, it is money to me, as the customer generally comes back and gives me the job the next time. I believe my way is right. I am running shops in two towns, employing from ten to twelve men. My idea is that if a brother smith will put up a fair price and then do his work right he can hold his trade anywhere. U. No.

With Regard to Prices—I have read M. A. Foster's plan to remedy low prices. He says in his opinion, the plan which would be ahead of any other for the benefit of the craft is to get a law enacted to compel every wheelwright and blacksmith to stand an examination relating to his trade. On passing such an examination, he would be given a diploma, which would entitle him to open a shop. Now, I have read the articles of Mr. Foster and Mr. Peterson and have been very much interested in them, as both are very capable men. But they do not agree on all points, for in the February issue they disagreed as to the setting of axles. Now we will suppose Mr. Foster was to be examined and Mr. Peterson the examiner. What would be the result? Would Mr. Foster have to close his shop?

We live in a small country place situated about six miles from the city of Oswego, N. Y. I began work here in 1870 and have been here ever since. Several times persons have opened a shop and cut prices. We paid no attention to them, and when a customer came to us and said that he could get his work done cheaper at the other shop, my answer always was, "Go and try them. We do our work as cheaply as we can afford, and if they can do it for less, I would go there if I were you." But as Mr. Foster intimates, men who cut prices are not skilled workmen. No one will find it out quicker than the customer. The result is that the price cutter moves to some other locality, and we are still here, the only shop in the place, and have been so for the last fifteen years.

We never cut prices or make private bargains. I think that will ruin a shop quicker than anything. If a man asks me to do his work for less than our price, I say I cannot do it, for if I should do his work for a less price, I would do so for everyone else, for to charge one man one price and another man a different price would ruin my trade and drive me out of business. Let the customer be the examining board. Monroe Hubbard.

Shoeing for Interfering—With regard to D. W. Cryce's question on interfering, in the October number of The American Blacksmith, I will say there are a great many different causes for interfering, and also a great many remedies. My way is first to balance the foot, that is, trim the foot perfectly level, not only on the bottom, but see that the foot is trimmed so that when it is on the floor it is level and in perfect line with the limb. This must be done before you can hope to have success with shoeing any faulty-gaited horse. For instance, if the foot is trimmed with one heel high on one side or the other, it will throw the leg out of line at the knee, about five times the difference in the height of the heels from the floor to top of hoof. After you have trimmed the foot level and have it perfectly in line, fit your shoe perfectly to the foot, and you will have no further trouble. If with an ordinary shoe it does not stop, put on a sideweight shoe, weight on the outside, but I will not recommend a sideweight except in extreme cases. There are many ways of correcting this fault, such as paring the outside of the foot down low and leaving the inside high and many other such preventions, but you can readily see that is throwing your horse out of balance instead of balancing him up. I will also state in case the foot is worn down so you cannot trim it level it must be done by calking the shoe. For instance, if your outside heel is low and you can't trim the inside down to it, turn your outside heel calk high enough to bring the low heel to a level with the high one.



EXCELLENT SHOES TO REMEDY INTERFERING.

With regard to the question of the pacing horse, or what is called cross-firing, it is a habit commonly found in pacers. In shoeing, trim the foot level, being sure the foot is perfectly balanced, then turn the shoe as follows: First, turn an ordinary shoe between the toe nail and the second nail on the outside. Weld on a spur, as shown in drawing at *A*, turn a low calk on the spur and a low calk on the outside heel—no calk on inside heel. Apply this shoe to the hind foot that does the striking. The shoe can be made any weight desired. If this is followed, you will have no trouble in either case. My trade is mostly with track and road horses, and I have all kinds of faulty gaits to correct. This principle of shoeing you will find will work on all kinds of fautly gaits. First level the foot, have it in perfect line with leg and you will have no difficulty in correcting the horse's gait. I have made a study of scientific horseshoeing, and will gladly give any information I can that will be of benefit to a brother smith. I should like to hear from Brother Cryce what success he has, after he has tried these principles of shoeing. L. H. Pinnell.

Gather on Axles—I note the criticism in the February issue on my position on the gather of axles by Mr. M. A. Foster, and he asks for an explanation, but there is really nothing to explain, since he admits that the principle is correct on new work, this being the kind my article dealt with. The question is rather to the point, however, and I feel that I ought to answer it, since otherwise, it might appear that it was mere talk and nothing to it.

I wish to state first that my reference was to vehicles of light build. The taper of the spindle on axles for this class of work is very slight and the pitch in the axle which is necessary to obtain a plumb spoke gives the bottom line of the spindle a slanting position to a line drawn through the center of the spoke. It is this slant, together with the pressure of the load from above, that crowds the wheel to the collar, and renders gather unnecessary. But suppose we reverse the position of the axle or turn it bottom side up In this position it is plain that the wheel would slip off when the vehicle was in motion. Let us try an experiment. Fasten an axle in a horizontal position bottom-side up, put on the wheel and set it in motion. While I am not an authority on the law of gravitation, it is apparent from a mechanical point of view that the weight of the wheel would carry it to the collar. This holds true with the axle in the proper position and the weight bearing downward. Another objection to gather is seen on a job standing on the floor,—a glance along the side of the wheels makes the rear axle appear shorter than the front one. To overcome this, some smiths make the rear axle a little the longest, but then what about the track?

I do not comprehend the logic of Mr. Foster's argument. He says when the axle becomes worn and lose in the boxing the wheel drops back and adjusts itself to the spindle. This being true and the wear on the spindle has been even from the collar to the nut, for what reason should the wheels be wider in front than in the rear? Mr. Foster, it is up to you now to explain the above. Nels Peterson.

THE
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Of Interest to Power Users.

The gas or gasoline engine prize article contest closes May 5th. Belated articles, however, mailed so as to reach us Monday, May 9th, will probably be in time. The prize award will be announced and the best articles printed in the June issue. It is intended, therefore, to make that number of special interest to all engine users. If any reader has any questions to ask about engines or power, or any difficulty he would like an explanation of, let him mail his question to the Editor so as to reach Buffalo by May 9th, and we shall endeavor to publish a solution of his difficulty in the June paper.

The Question and Answer Columns.

It is our wish to again call attention to the "Queries, Answers, Notes" department, which occupies the last few reading pages in each issue. The main purpose of this department is to be of service to readers, and afford them an opportunity of asking and answering questions, or of giving opinions upon anything printed in our columns. Criticisms, questions, answers and comments on topics of craft interest will always be gladly received for publication. We desire to have readers feel that The American Blacksmith is *their* paper, published at all times for their benefit.

Subscription Contest.

Prize Award.

On April first closed the prize contest for securing the greatest number of new subscribers to The American Blacksmith. We are pleased to announce the award of the twenty-five dollar prize to Mr. E. R. Raymer, of Johnstown, Pa., who sent in 73 subscriptions. The contest was a most vigorous one, and an unusually large club was required to take the prize. As in all other similar contests of The American Blacksmith, no one drew a blank, the prize being in addition to the regular cash commissions which are offered at all times in return for the trouble of procuring new subscriptions.

Send In a Photograph of Your Shop.

Is your shop conveniently arranged, well equipped or neatly kept? Send a photograph of it to the Editor of The American Blacksmith for publication in these columns, if you have a picture or can get one taken. The boys like to see what kind of shop the other "fellow" has and how it is arranged. Such shop photographs are among the most interesting items appearing in these columns. Send interior views if possible, showing as many of the tools and machines as possible, and add also a description of the shop, its equipment and the work that is principally done.

Population Estimates.

The Census Bureau has just issued a bulletin which gives the estimated population of the United States for 1903, exclusive of Alaska and the insular possessions of the United States, as 79,900,389. This is an increase of 3,905,814 since the census of 1900.

According to these estimates, New York is now a city of 3,716,139 inhabitants; Chicago of 1,873,880 inhabitants; Philadelphia has 1,367,716; St. Louis has just passed, and Boston has almost reached the 600,000 mark; Baltimore has 531,313; Cleveland is ahead of Cincinnati, which cities have 414,950 and 332,934 respectively. Buffalo is credited with 381,403; San Francisco with 355,919, and Pittsburg with 345,043. Detroit, Milwaukee and New Orleans have just passed 300,000, and Washington is close to that figure.

In the number of towns and cities having over 10,000 inhabitants, Massachusetts is in the lead, with 47, containing a total of 2,197,706 inhabitants, but this total of urban population of course is not as large as that of New York, Pennsylvania and Illinois. Considered by States, New York leads in population with more than seven and a half millions.

The Outlook in the Steel Trades.

The regular quarterly statement recently issued by the United States Steel Corporation is interesting, as showing the condition and prospects of this most important branch of the country's trade. While the earnings for the quarter ending with March, $11,263,241, were less than for any quarter since the formation of the trust, the indications are that business is regaining its former activity, the unfilled orders at the end of March exceeding by nearly 920,000 tons those on the books at the end of September. The demand for pig iron is steadily increasing, as is that for steel also. In finished iron and steel the outlook is very favorable, though the structural steel market continues quiet under the influence of labor troubles. The railroads still continue to purchase light for pressing needs only. It is safe to say that the iron and steel industries are picking up, leaving little occasion for worry as to the outlook. We usually look for an impending Presidential election to exercise a quieting effect on trade, but the indications seem to point to this being a much less potent factor in trade conditions than it generally is.

Altogether the trade outlook is most

encouraging. Let us hope that the blacksmiths will enjoy their share in the prosperity.

A Four-fold Iron Entrance Gate.

The accompanying illustration shows an ornamental iron entrance gate which was manufactured by the J. E. Bolles Iron & Wire Works, Detroit, Mich. for the City National Bank, San Antonio, Texas. It will be observed that these gates are made four-fold in order to diminish the space occupied when the gates are open during the day. The frame work and hinges are sufficiently strong to prevent any sagging, and the design is such as to give a pleasing effect. The ornamental leaf work at the center is provided with a neat brass monogram. The closing and locking device was carefully looked after, making the gates, when in place, both ornamental and durable.

Talks to the Jobbing Shop Painter.—14.

M. C. HILLICK.

Graining Walnut, Mahogany, Rosewood.—How the Various Grounds are Prepared.—Graining Colors Used.—Tools Required.—Directions for Doing the Work.—How to Learn the Art of Graining.—Opportunities Offered, etc., etc.

A subscriber of THE AMERICAN BLACKSMITH desires to know how to paint a buggy body the different colors they are painting some now. That is, they are painted dark with red streaks in them. Inasmuch as this is a topic of general interest, it has been deemed proper to incorporate the reply under the above caption. What our correspondent refers to is merely a "fad" fashion which for the past 18 months has prevailed in some sections of the country, and as "fads" go, they may be here today and gone tomorrow. This particular fashion embraces painting the bodies in walnut, mahogany and rosewood, the latter being especially popular in the South.

The imitation of these woods upon carriage bodies calls for expert skill as a grainer, and the average carriage painter would make a poor showing along this line of work without having received any previous instruction and practice. The graining is all done, or should be, in distemper, because smoother surface effects may be obtained, and because, moreover, the woods mentioned may be more accurately imitated in distemper than in oil. Indeed, it would be unsafe to apply oil graining upon a surface brought up and rubbed down on hard brittle roughstuff coats. The surface would have a right to crack and fissure to an ugly depth, an operation it would speedily undergo.

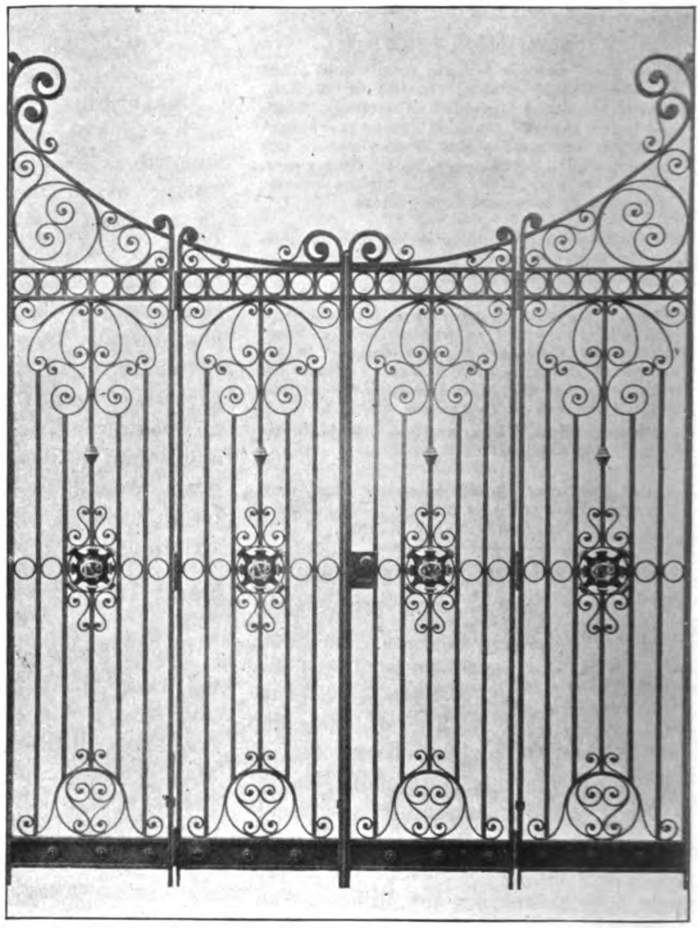
To prepare for the graining, bring the surface up in the usual way—that is to say, apply the regular filling up and roughstuff coats, and rub down with fine rubbing stone.

For rosewood, make the ground black. For mahogany, the ground should be a bright orange to make which, add enough red lead to chrome yellow to deepen the desired shade.

For walnut, a drab-brown is required. To make this brown add equal proportions of finely ground yellow ochre and Venetian red to flake white to produce the shade desired.

The graining color for the walnut should consist of Van Dyke brown, 3 parts; Indian red, 1 part. Wet the ingredients up in stale beer. The ground colors should be mixed to dry flat and thinned with turpentine sufficiently to be applied with a camel's hair brush.

To grain walnut, saturate a soft sponge with the distemper color, then squeeze out the excess of color, and wipe the surface over very quick. Then beat out the color with a mottler, striking the brush softly upon the surface, and aim to bring out all the peculiar under grain and tracings incident to this beautiful wood. Next graze the surface with a mixture of raw linseed oil, pale drying japan and turpentine. This should be applied with a camel's hair brush, and is used to set and hold the color in place. Now take the Van Dyke brown alone and having wet it up in the stale beer to the proper consistency, saturate a clean, soft sponge with the color and wipe over the surface. Once the color is wiped solidly over the surface, draw a piece of chamois skin over the thumb or finger and proceed to wipe out the lights. Then with a piece of hickory shaved thin, 1 x 4 inches, and technically known as a blaze stick, run the stick out the full length of the panel. Now with a blender, a brush especially made for the purpose, blend in the color or wipe it out as it is found necessary to develop the splendid lines and graceful waves and curves natural to the mature walnut. Seek to blend out the prominent grain of the wood in a way to bring forth the brilliant black tracery and soft warm shades of brown always a part of a walnut panel. It will be understood that these various operations must necessarily be completed very quickly, and if the work should prove unsatisfactory, you have only to wet up the color and try over again. This feature is one all-important advantage in favor of distemper graining, and enables the beginner to try and try, until he becomes familiar with the various operations and succeeds in making them at least fairly successful.



A FOUR-FOLD ORNAMENTAL IRON GATE.

After the work with the blender has been concluded, rub the surface over gently with the palm of the hand, applying a light uniform pressure which

serves to tone down and soften the texture of the graining.

The ground for mahogany is made of chrome yellow and orange red lead, using sufficient red lead to deepen the yellow to a bright orange. The directions covering preparation of the ground for walnut apply also to mahogany. It should always be understood that a defect in the ground cannot be corrected with the graining color or after this color has been applied.

The graining color should consist of burnt sienna, 2 parts; Van Dyke brown, 1 part, wet up in stale beer. The directions for graining walnut apply likewise to mahogany. The blaze stick is, of course, used less freely, the blazes of the wood running shorter and less regularly than in walnut. Otherwise the grain is made very similar to that of walnut.

For rosewood—a very difficult wood to imitate closely—make the ground a dark, reddish, warm brown. The graining color should consist, for this ground, of Van Dyke brown lighted up a bit with burnt sienna. Rosewood has a grain that runs full and regular for a little distance only to end in a snarl of knots and dark, sombre knobs, then disappearing in a stately sweep of rich wood colors. After applying the graining color, mixed in stale beer, with a soft sponge, use the top grainer and a camel's hair pencil to develop the grain and conformations of the wood as desired. Then for an enrichment of the graining color proper, and to give it depth of brilliancy, glaze the surface with madder red, using just enough of the red in thin varnish to stain the red. Some grainers use a dead black ground for rosewood. Then with stale beer wet up dry drop-black and wipe on with a sponge. Then with a top grainer and camel's hair pencil, work in the grain. Then glaze with rose pink and asphaltum and wipe out knots, and lights and shadows, to match the wood.

It will require close study of the peculiar characteristics of rosewood to enable the inexperienced grainer to produce a first-class imitation of the natural wood. To handle distemper colors successfully over large surfaces, the work should be done in a cool, dry room, quite free from draughts of air. In a warm room the color sets up too quickly for easy or successful manipulation, a fact that should always be taken into consideration.

In case it is necessary to work in over-graining, it is well after stippling and working in the fine under-grain, to glaze the surface with a mixture of raw linseed oil, pale coach japan and turpentine, to fasten this part of the graining. Then when this coat is dry, proceed with the necessary over-graining, which consists in bringing out the prominent grain, and the lights and shadows of the design.

There are numerous mechanical devices in use for graining the woods above mentioned, and others, which are recommended to imitate all growths of wood and work in any color and to be successfully handled by the most inexperienced. For information concerning these tools, we would advise our correspondent to write to "Stencil Treasury," 209 E. 59th St., New York.

Perhaps the best way to study the form and color of the grain of any wood to be imitated in graining, is to procure panels of veneer of the woods desired. Obtain at least two panels of each of the woods to be studied, and one of each finished up, leaving the second one unfinished. This will afford the means of a comprehensive study of the various woods in their natural and finished state which is, in fact, the most instructive and practical method of studying them.

The jobbing shop carriage and wagon painter should at least be able to do a fair class of graining, for today many business vehicles of the paneled top style have interiors grained in imitation of different woods. Moreover, a knowledge of the grainer's art will be the means of giving him employment during dull seasons when otherwise he might be idle.

A Few Essential Points in Wagon Building.

Prize Article.

JOHN BRECKINRIDGE.

Wagon building covers a wide and varied field, so I will only attempt to mention what I have found to be the most essential points.

First find out what kind of work is expected of the wagon and the kind of roads it has to travel over. Next make it as light as possible to stand the loads without undue strain, as over-strain on anything soon depletes its lasting qualities. Next use nothing but white oak or hickory, well-seasoned, but not kiln-dried, as that makes it brittle. These are three good points to begin with, which I term the foundation. It matters not how good the other part is, if the framework is poor, it will be a failure clear through. In other words, what good is the upper part of the body if the material in the sills is poor, or the running gear if the coupling pole is bad and the axles common?

I have been building wagons of all kinds for twenty-two years, and am now in a great trucking district. The wagons consist of one horse, three-spring; two horse, four-spring; and two horse, six-spring, and are of a high standard. They make forty miles a day, and have the biggest loads, so you see we have to make them good. In building these wagons, we usually make the body first, which is 10 feet 6 inches long, by 5 feet 6 inches inside. The sills are 1⅞ inches thick by 3½ and 4 inches wide, with four mortised cross bars in the bottom, one at each end, and one over each spring. Sometimes they are plain, and sometimes panelled, the panels being one inch by ¾, chamfered, with solid fillers in corner and flaring sides with five strap irons to each side. Then I made my axle beds, which should be 3¼ inches deep in front under fifth wheels, so in mortising through for the hounds the strength of the bed will not be destroyed. In mortising your front bed piece for the hounds, cut it ¼-inch lower at the back of the bed than in front, so that the hounds will pitch upward in front, which is necessary in order that the tongue will not set too low at the joint. After wearing awhile, the back bed in the center should be 2½ inches deep, and a part where the springs rest should be 3 inches deep, thereby adding strength to the axle where it is most needed. After shaping my axle beds to gauge, I then take up my axles in two parts, right and left, and shape them to the beds. You have to heat them of course.

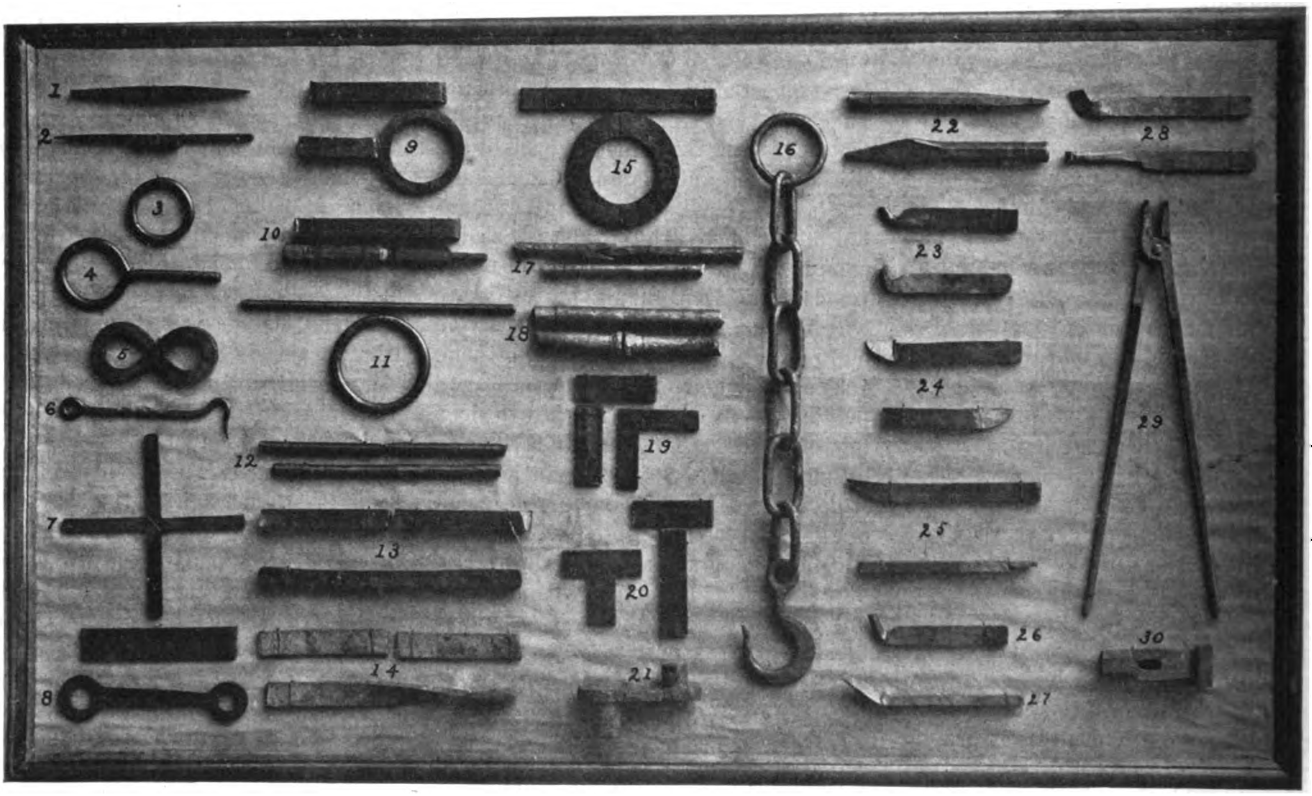
I then lay them aside and run my tires, with one front wheel and one hind, allowing three times the thickness for the weld. I bend my gage to the wheel, if I have no pattern that height. You can easily make one by taking a soft piece of board about twenty inches long and placing it against the wheel, marking under and above with pencil and cutting down. I do this bending by gage, and find it pays, as it prevents straight or flat places in your tire, which when put on often burns itself into the rim, making a bad looking job. This is my method, and I find it pays to be particular when it gives good results.

Next I proceed to weld, which is not necessary to discuss. After welding tires and putting them on, this gives me the exact dish of my wheel. I can find my length for the axles by laying straight edges across the face of the wheel and measuring to the back of the hub whatever length this is, whether six, seven or eight inches, and doubling it

to give both sides twelve, fourteen or sixteen inches, or whatever it might be. Deduct it from your standard tracks. (Mine is 65 inches, and if say we deduct 16 inches from the 65 inches, it gives 49 inches between collars.) Then add one inch for swing, making your axle, say 50 inches between collars. Now give this swing at top, enough so that when your wagon is loaded your wheels will be only $\frac{1}{2}$-inch wider at the top than at bottom. An axle set like this creates little or no friction. An axle set like this will also hold grease six to eight days. Of course you must use good axles. Concord solid collars I find the best. The spring bars are two inches thick by seven or eight inches wide. It is better to be a little heavy so you can let the spring upon them without weakening them. Always let the bolts that fasten the spring bar to the spring go through the sills of the body if possible, then in case one breaks you do not have to lift the body, entailing much time and labor. The doubletree ought to be two inches thick in such wagons, and four inches wide in the center and four feet long. This gives a good length single-tree, which prevents rubbing of the animal. The hounds should take tongues four inches wide at the front and three inches at the back. Our tongues are all 9 feet 6 inches long from point of the hounds. I use 3-feet 4-inch and 4-feet 4-inch wheels for two horses, $1\frac{7}{8}$ spokes, $2\frac{3}{4}$-inch and 3-inch tread, and $\frac{5}{8}$-inch tire for this kind of wagon. The coupler pole should be 5 feet 10 inches or 6 feet long, thereby letting the front wheels turn under the body without rubbing.

In bolting up or putting the work together, always bore the holes the same size as the bolts, or else it will never stay tight. Let a new job work loose all over and it will soon be a wreck as you well know. I have wagons running now for ten years without a bolt getting loose.

Pay attention to the details, and the job as a whole will take care of itself. Good stock, intelligent designing and careful fitting are the essential points. The good smith holds every customer.



SPECIMENS OF FORGING EXERCISES EXECUTED IN THE CLARKSON SCHOOL SHOP.

Forging at the Clarkson School of Technology.

W. S. GRAFFAM, SUPT.

At Potsdam, in the northern part of New York State, within nineteen miles of the St. Lawrence River, and somewhat over one hundred miles from Montreal, is located a technical school which has come to occupy a position in the front rank with those preparing for engineering professions. The Clarkson School of Technology carries on educational work similar to that of other representative technical schools of the country, and is included by the United States Civil Service Commission in the list of approved techincal schools, diploma from which entitles the holder to promotion in the Engineer Department at large. Its graduates from the four years' engineering courses receive the degree of Bachelor of Science from the University of the State of New York, with which the school is affiliated by its charter, granted in 1896. The young men who have gone out from the school in the four classes thus far graduated are doing credit to the professions in which they have engaged, and are coming to occupy positions of trust and responsibility.

The work of the four years comprises instruction in language and literature, the applied and economic sciences, mathematics, engineering and technology. Included in the latter are the courses in workshop instruction; woodworking, wood-turning, and patternmaking, iron and steel forging, moulding and foundry practice, iron work at the bench, machine tool work and mechanical construction in machine shop practice. In all of these classes of work the shop exercise system is employed to familiarize the student with the elements of constructive mechanics. Final project work is required, exercises from the students' own designs or otherwise assigned. The student is daily acquainted with the economies of time and material required, by using the shop order card system of accounting for the same.

The course in forging is planned to teach the students the fundamental principles of smith work and the heat treatment of iron and steel. It affords that combined training of the mind, the hand and the eye, which is so desirable as the result of well-developed courses of work-shop instruction. This is accomplished by a carefully-graded series of thirty or more forging exercises.

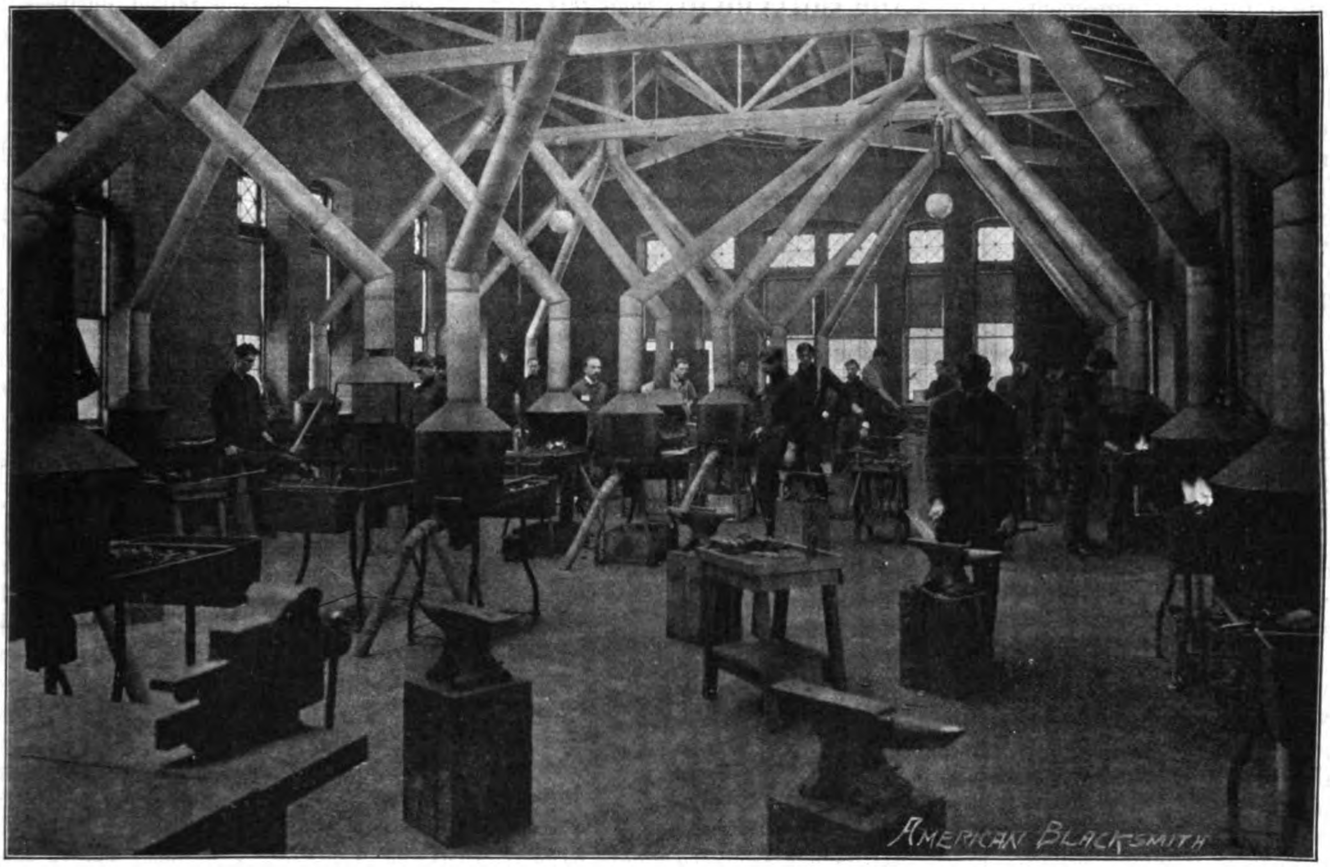
The forge shop of the school is well equipped as follows: Twenty-four forges and anvils, and the necessary small tools; shears for cutting hot or cold metal, blacksmith's drill, bolt-header, vises, swage-block, work benches and a case of draws in which students keep small tools and finished exercises. At one end of the shop is a suitable store room where the iron, steel and other supplies are kept. The shop is well lighted by large over-head sky-lights.

The exercises are graded in a way to show the students, step by step, the principles and successive processes of the work. The first exercise is to draw out a piece of one-half inch square Norway iron to a flat edge at one end, a square point at the other. The second exercise is similar to the first, but requires swaging over the corner of the anvil. The third introduces bending in forming a ring out of round iron. The fourth is a compound bend to be worked.

Throughout the entire course the student is carefully shown the several processes, illustration and application of the principles of forging. These comprise drawing out and pointing, swaging over corner of the anvil, bending, twisting, splitting, punching, drawing out a ring to larger diameter; forming round, hexagonal, octagonal and rectangular shapes from the square; welding in different ways such as ring, lap, split, chain and butt welds; the making and tempering of tools, including a complete set of cold chisels and lathe tools to be later used in machine shop work. In tool making the student is required to dress over an old, worn out tool of each kind, also to make a new one like it. Aside from the above, many special tools are made by the students and special forgings for repairing old or making new apparatus for the school.

In the accompanying cut the exercises are arranged to show the sequence of the work as numbered, beginning at the upper left hand. In many cases the piece of stock from which the exercise is made is shown with the finished piece. Each exercise is first made and fully explained by the instructor before the class, and the points where the student is liable to have trouble are pointed out. The students are also supplied with blue prints of the exercises and importance is attached to following details and dimensions. During the course in forging, several lectures are given on the manufacture of iron and steel, and the composition and heat treatment of the same, in which students are required to take notes.

In this way the course is practical and educative and the quality of work done has fully justified the methods pursued. Thoroughness is aimed for at all times.



INTERIOR OF FORGE SHOP, CLARKSON SCHOOL OF TECHNOLOGY.

An Axle Gage.—Disc Sharpening

ANDREW COBA.

I have an axle gage which I consider most handy and very easy to use. It is always ready. It has a straight edge long enough to reach from end to end, and four screws in each end and one side. I use one for top gather, and the other for back gather. I take the gage and set my screws to the old axle. Then set the new stubs by that and I have never had a word of complaint. I adjust the screws to fit tight.

I have always had a great deal of trouble with my disc sharpener and

could not keep my bits from heating until recently. This spring when I received a disc to sharpen, after using up one bit, I thought of putting water under the disc so that it was in the water about two inches, thus keeping the bits from getting hot. I hope this will be useful.

The Progressive Smith as a Business Man.—8.

The Foundation of a Contract.

BILLY BUNTZ.

By understanding the elements of a contract the progressive smith becomes shrewd, as he is enabled to make agreements so they will favor himself while having his customer fully agree to have a job done and to pay the cash into hand. A smith not shrewd might guarantee a job for a lifetime and even forget to have his customer agree to pay for it.

The principal requisite in making a profitable contract, whether it be a verbal understanding or a written agreement, is to promise little while completely binding the customer to strict terms. Some smiths, being enthusiastic, are prone to guarantee a job to their own detriment, simply because they can do excellent work, or to put the price exceedingly low for fear the customer will back out; whereas, it were better to politely refuse such jobs. As a rule, the higher a job is guaranteed, the more the customer expects or demands, while a low price leads him to think it might perhaps be done still cheaper. The guarantee should be only a general statement, the price plenty high to admit of say 25% or 50% profit when taking into consideration the wear and tear on tools and machinery, rent of shop, etc.

To get some customers in the proper humor for having a job done or entering into a contract requires considerable knack, hence the progressive smith studies his business, his customers, and uses shrewd methods. He does only small jobs on verbal agreements, while those amounting to several dollars or where the obligation cannot be fulfilled for a week or so, he puts in writing. Generally speaking, a written contract *proves itself*, while a verbal understanding is apt to become misconstrued where it covers a big job or considerable time elapses before the work is completed. All folk are not honest, some will lie for gain, others change their mind frequently, while some may agree to the price at the time but afterwards say they misunderstood, or that the job was not as good as promised.

The shrewd smith makes a verbal contract thus:

"Want a *good* job done?" he asks, examining the horse's feet and waiting for his customer to bite.

"Certainly, the best you're capable of."

"A bad pair of feet," he continues, as he plumbs the animal's leg.

"Well, pare the hoof down or level it up."

"That won't allow him to work to advantage or give him much speed. He interferes—has a heavy cross-fire. The way he is now he might trip and break a leg or become stiff-kneed by a sudden wrench."

"Any way to remedy that?"

"Special shoes will help him—maybe in time put him to handling his feet much better. They're the proper thing. Fixed Wilson's horse that way and he says it's doing well. 'Course, costs a little more, but is likely to prevent his stumbling and really pays in the end."

"How much?"

"Five dollars cash for the two hind feet—he's all right in front, otherwise it'd be $10. Take me a couple hours to do it. No doubt it'd help him as much as anything."

Having talked business, he waits for his customer to say "Go ahead." Meanwhile, he might mention the price again, saying that so far as he is concerned he would make about as much on plain shoes, but hates to see a horse go half crippled, like a nigger with his heel worn sidewise.

It will be noted that he has guaranteed nothing, further than to recommend special shoes as *a good thing*, which is only a general statement or one quite different from a guarantee that the horse would thereafter use his feet properly, or if not, to bring him back and the job would be done over again free of charge! The shrewd smith would charge $5 more for a second shoeing and remark about the foolishness of man allowing a horse to become so crippled in the first place—that a bit of prevention would have remedied the trouble in the start, while now it might be necessary to work on him for months, but that it had to be done.

Should the customer agree to the verbal understanding, or say "Go ahead," all of the elements of a well-drawn contract have been complied with, the smith promising to shoe the horse in a special way, and the customer assenting to its being done, the price to be $5 *cash*, from which the customer knows he is to hand it over on completion of the job.

The general explanation gone through in talking to a customer is what would be termed a *secondary* or *modifying* element in a written contract, while the primary elements are: The Parties; The Consideration; The Subject Matter; Mutual Assent; Time. Should any one

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This Agreement, *made this.......................day of.......................1904, by and between William Anderson, a Blacksmith and Wagonmaker, doing business in Wilton, County of Scott, State of Illinois, party of the first part, and.. of the same place, party of the second part;*

Witnesseth: *That the said party of the first part hereby agrees to build for said second party, one ....wagon of following specifications:*

(A)..

....

....

The party of the second part agrees to having the party of the first part build for him the wagon above described, and to pay therefore the sum of forty (40) *dollars, of which amount ten* (10) *dollars is paid down as part payment to bind the sale, and its receipt is hereby acknowledged by said first party; the said party of second part agreeing to pay the balance of thirty* (30) *dollars upon completion of said wagon.*

The party of the first part further agrees to finish and deliver said wagon to the second party at the smith shop within thirty days from the date hereof, which time the second party accepts as reasonable and fully agrees to.

In Witness Whereof, *said first and second parties to this agreement have set their hands and seals the day and year first above written.*

WITNESSES: *William Anderson* [SEAL]

J. W. Graham. .... [SEAL]

D. E. Ottman.

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of these be left out, while there might be an *agreement*, there would be no contract —nothing which could be enforced by action at law. If no mention was made as to the *time* the work was to be completed, the customer could say that he had lost money by waiting and had bought elsewhere on account of the job not being completed in time for his work. Or, a contract would become void were the consideration not mentioned or the subject-matter left out as to what work was to be done, or the parties' names not mentioned, or the

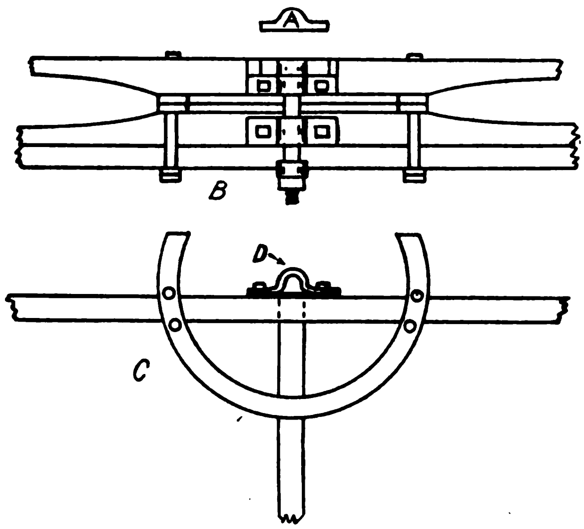


Fig. 1. FRONT ELEVATION AND TOP PLAN VIEW, SHOWING KING BOLT ARRANGEMENT.

agreement not being signed, etc. Where an element is missing it gives the customer a chance to crawl out.

In the verbal contract mentioned, the smith and his customer are the Parties, the consideration being $5 cash, to which the customer Assents, while the Time was stated as "a couple of hours." The Subject-Matter was shoeing *the horse with special shoes*, while the "hot air" given the customer to induce him to have the work done was a *secondary* element, although it modified the contract very little, as the smith did not make an absolute guarantee.

Legally defined, a contract is an agreement between two or more parties, competent to contract, based on a sufficient consideration, each promising to do or not to do some particular thing possible to be done, which thing is not enjoined or prohibited by law. It is unlikely he would ever have occasion to make a contract which would be unlawful or that would lack having a good consideration. Nor it is likely he would ever do business with a crazy person, whom the law considers incapable of making a valid contract, but he should be careful in dealing with a young man, as general laws favor him, while he is a minor. Small jobs may be done for him without assuming much risk, but where the amount is large enough to put the contract in writing the smith should have the boy's father sign with the boy. This is particularly advisable in contracts relating to "The Hire of Smithshop Help," which will be treated in the next number of THE AMERICAN BLACKSMITH.

A sample form of written contract is displayed on preceding page. In the blank space may be inserted the primary and secondary elements necessary to make a complete contract. For instance, the smith may agree to build a particular kind of wagon, describing it in the space marked "A," giving a specification of all the minor parts and mentioning the kind of material—in fact, giving a long description so the customer will see he is getting his money's worth, but promising or guaranteeing only such things as can easily be complied with.

Or he may use a similar form in soliciting trade, as by agreeing to shoe and clip the horses of a certain livery for one year for a specified amount. Where a smith keeps after big jobs of this kind he is likely to land some of them, thereby having an assured income outside of his regular work; and the smith who is shrewd in closing such contracts will make more money out of them than his brother, who allows some attorney to draw the contract and bind him as tigthly as his customer—probably allowing the customer to do all the dictating.

It will be observed that the "wagon" contract contains all the preliminary elements, as well as secondary elements.

Where the smith builds wagons and other things, or wishes to contract with livery or other concerns for shoeing and clipping, he can have some typewritist run off ten or fifteen copies of such form of contract as he wishes to use, so he may be enabled to go after special custom in a business-like way.

(*To be continued.*)

A Good King Bolt for Wagons.

J. LAWRENCE HILL.

The accompanying illustrations represent a very simple design, not only in constructing, but in repairing, the other feature that commends itself being that it is much stronger than the same size iron when it goes through axle, axle bed and head block.

It is obvious that in boring a hole through these pieces, it destroys much of the strength; therefore any method which successfully overcomes this difficulty, and yet is easy to make, ought to be acceptable to builders of light spring wagons, or even buggies where extra strength is required without additional weight.

In Fig. 1, B, we see the front elevation, showing king bolt in front of bed and axle. A is the shape of king bolt head. Fig. 1, C is a plan of fifth wheel. Fig. 2 is a sectional view, cut through center of king bolt; B, head block; C, axle bed; D, axle; E, king bolt; F, nut; G, stay; H and J, the flat staples seen at D, Fig. 1. Fig. 2, I, is the fifth wheel. It will be noted that back of D, Fig. 1, is a thin iron plate to take wear off king bolt. Now you can see how easy it is to unscrew these few nuts, replace any worn parts, and put it back again without the necessity of undoing spring clips, etc., and raising the body.

This king bolt can be used with a full circle fifth wheel, and when so used, the fifth wheel is a little smaller in diameter than when made as per drawing. It is also equally as well adapted to end or side spring gears, and will be found a most easy working, steady and lasting method of king bolt construction, the most vital part of a vehicle.

During some months of the year many country blacksmiths experience a slack season. It is in just such times when, by a little forethought, a wagon or two can be built without much of a cash outlay, and with this end in view, any and

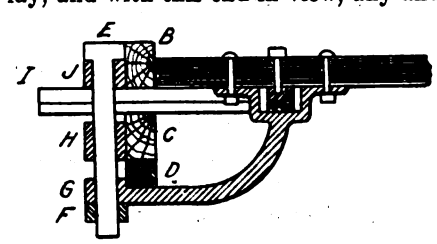


Fig. 2. SECTIONAL VIEW THROUGH KING BOLT.

all parts which can be made should be, instead of being bought, ready made.

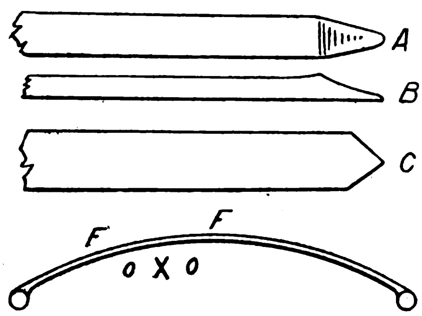
The writer knows by experience that there are many men who prefer a hand-made vehicle to a factory built one, and yet will not give an order for one, but if from time to time progress is noted on one under construction, interest is aroused, and it is then easier for the builder to dispose of his vehicle. The progressive blacksmith finds it necessary to at times risk a little in the

construction of a vehicle or two during the slack season. Very often a start made in this way opens up a profitable wagon-making business.

Hints on the Welding of Springs.

RICHARD O'HEARN.

A weld is not a good one when the repaired spring breaks near the end of the lap. The steel has been overheated, caused probably by putting the spring in the fire with the ends riveted or partly stuck. When a spring is thus put in the fire there are two thicknesses



SPRING WELDING—TEMPERING.

at the end of the lap. It will therefore be seen that the single thickness will suffer somewhat while the double thickness is getting hot.

I wish to say that I consider the best way to weld a spring is to scarf it, as shown at A, (and at B, the side view) staving up from the corners on the anvil, as at C. Take separate heats, weld and finish in one heat. Use some welding compound, of course. If you don't succeed in making a good weld the first heat and finishing the weld at the same time, just take another heat—a light borax heat—to finish with. Keep on trying, however, for the single heat, and you will get there sooner and easier than you think. Don't put in any piece to give the full length and thickness to the finished job. With good coal and ordinary care, there is no waste to speak of in welding a spring, if done with one heat. I have been welding springs for the last twenty-five years in this way, and have had only two springs of my welding break.

As to tempering a spring where you weld it, I would like to ask the question, "What is the use of trying to temper it where you weld it when by the attempt you take the temper out at two places while trying to put it in at one?" D shows the spring. Welding at X takes the temper out of it from O to O. One smith puts the temper back by heating it from O to O, and pouring oil on it. This, however, will leave the spring soft at F and F. A spring cannot be tempered in sections. Where a bath that will temper the whole leaf is not used, the quickest and as good a way as any which I have found is to cold-water hammer the spring into shape (after welded and swaged) and cool in tub as soon thereafter as possible.

The Way to Mortise Bolsters.

BY G. E. B.

The proper way to mortise bolsters is to make the mortises about ½-inch closer together at the bottom than at top, thus causing the stakes to flare out. When the nut is put on the stake, and tightened, it draws the stake to its right place, which is about ½-inch from square. At A is shown a bolster mortised the wrong way, and when the nut is tight it appears as at B. C shows the bolster properly mortised, when driven, and D when the nut is tight.

A Chatty Letter from Canada.

GEORGE NABLO.

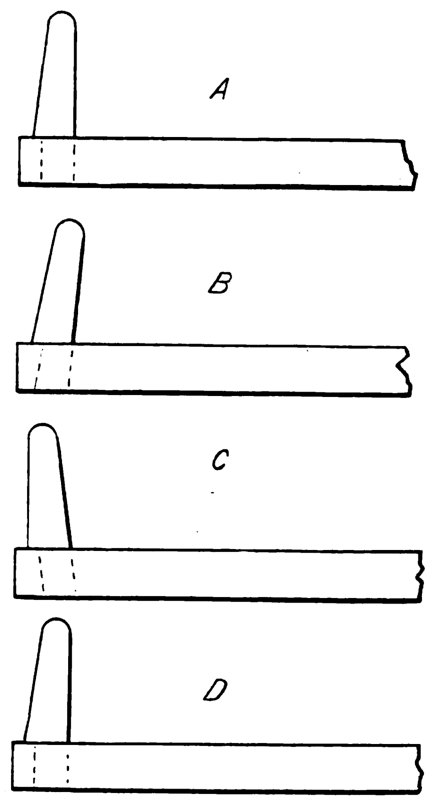
The winter that is now happily over, has been one such as the oldest inhabitants cannot recall, in many ways. Farmers here are accustomed to do fall plowing until nearly Xmas. But Jack Frost came in about the 19th of November and came to stay. In consequence, everywhere plows could be seen firmly imbedded in the snow and ice in the level fields, and weather became colder and colder, then snow came on and in abundance, with storms and zero weather, without a thaw until the latter part of January, when a thunderstorm, with icy rains, turned the snow into ice, flooding fields and highways, which, when freezing weather again set in, made travelling a very dangerous affair without sharp calks on the horses. The consequence was, that the smiths, who all do shoeing, had a very busy time of it all winter. Usually once or twice shoeing sharp is all that was required, but this winter four or five resharpenings were required, so that without the aid of horseshoers, the business on the roads would have been impossible. This winter has demonstrated the importance of the smith and his supremacy in usefulness over that of almost any other vocation. For if they had not been able to keep horses in a travelling condition, business in nearly all lines would have been paralyzed. The prospects for spring and summer work are very promising. The sharpening of cultivators, harrows, etc., is now in demand, and the repairing of vehicles will follow as soon as the roads are good and passable. Close onto that will follow the repairs of mowers and later on of binders, which, if the weather is hot, will be interrupted by tire setting, etc. So the outlook in our line is a very fair one for this locality near the banks of Lake Erie. I would be pleased to hear from others of the craft, how this cold winter has affected their business in various parts of the country, and one could thereby get some idea as to the benefits derived from a hard or a mild winter in the line of general blacksmithing. I hope that all the brothers will be favored with a prosperous year.

An Adjustable Clamp and Rim Wrench.

H. E. KERNEK.

Having been a constant reader of THE AMERICAN BLACKSMITH since its first issue, and having seen therein many useful recipes, also many handy devices from brothers of the craft, will undertake to describe one of the tools in my shop that are entirely of my own make, for perhaps some of them would interest brother smiths.

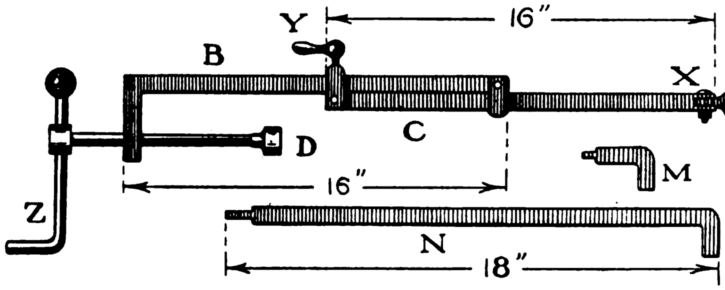
The tool described herewith has been thoroughly tested, and I can therefore



THE RIGHT AND WRONG WAY TO MORTISE BOLSTERS.

recommend it to any brother smith who desires to make one. I might say that I would not do without it under any condition. The accompanying sketch shows the tool, a combination rim wrench and clamp, which, with its many adjustments, will make a clamp that will take in anything from 10 to 42 inches (including wagon box bottoms)

and will make a felloe clamp that will work on any wheel from the smallest to the largest. It is sufficiently strong to draw the rim or felloe. Referring to the sketch, it will readily be seen how it is made, the dimensions also being given. B and C are top and bottom sliding bars, one inch square. M and N



A USEFUL TOOL FOR THE WAGON SHOP.

are removable clamp bars, one inch square, which can be fastened on the end of C by means of a half-inch bolt at X, instead of the ring A. This ring is to go over the hub, and is ten inches in diameter Also I have a six-inch ring for small hubs, made of $\frac{5}{8}$-square stock. Y is the clamp screw. Z is crank-lever made of $\frac{5}{8}$-inch iron 12 inches long with a $\frac{3}{4}$-inch screw. D is a swivel head.

To Make a Tire Tightener.

D. A. DICKSON.

The accompanying illustration is that of a good and simple tire tightener of my own make. First take a steel bar 3 by $\frac{3}{8}$ inches, bend perfectly round and leave four inches open at the joint. Next make two ears and rivet on with three rivets in each. Put holes in the ends to receive a $1\frac{1}{2}$-inch bolt, threaded right and left hand as indicated. Make three corner irons, and rivet one on back to be bolted to table, and one on each side to slide in a groove or clip. Make segments to fit the inside, as shown in cut, five in all, to make a complete circle, with one-inch spaces between joints. Enough of these are to be made so as to fill space between rim and tire of wheel, fitting neatly in the circle. It is now complete. Place on plate large enough to allow outside band to lay on.

To operate, put the wheel in and fit with segments, leaving joint of outside band about three inches open. Slacken screw and take the segments next to wheel and place in fire made of wood or bark, and when fairly hot, place next to tire and screw up tight. Allow the tire to expand a little with heat, and then take out and let cool. Take next wheel of same size, and so on.

Now that winter is over, any ordinary smith that has a little slack time can make one for himself, and have it ready for his spring trade. This tire tightener is for light wheels only. Larger ones can be made accordingly.

Repairing Old Wheels.

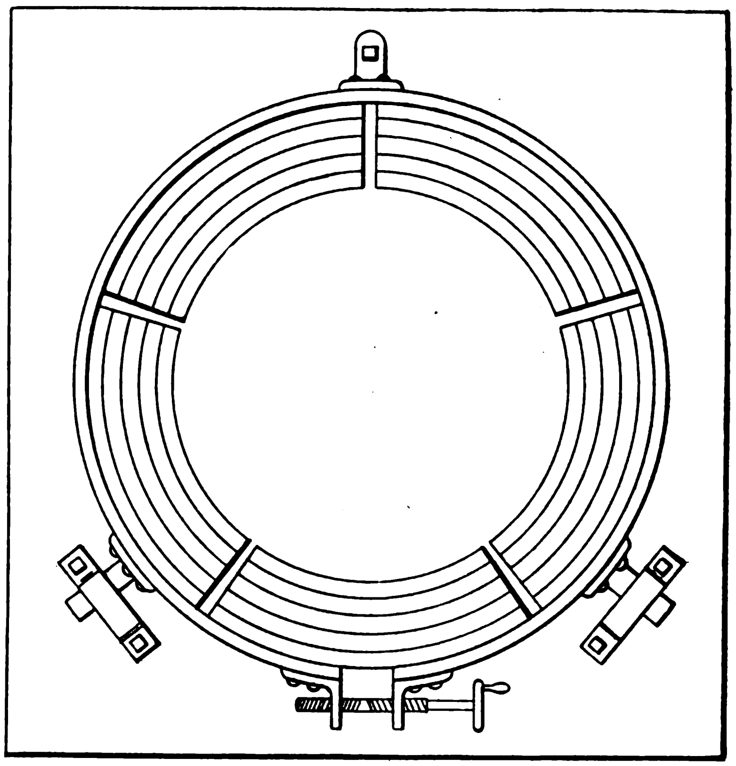
M. A. FOSTER.

I have had considerable experience in repairing wheels, and find it a more difficult matter to repair some old wheels than to put up a new wheel. Take especially an old hub that has been filled two or three times, and is considerably cracked, which will naturally cause some of the mortises to be larger than others; fit each spoke for the mortise you expect to drive it in.

When a few spokes are put in a wheel that is badly dished, the new spokes must be driven to correspond with the old ones, or if not, the wheel will be crooked. In pointing the spokes, point them as low as possible, then run the hollow auger straight with the face of the wheel, not with the spoke, and then the rim will go on snug and level. I have seen many wheelwrights bore the tenons straight with the spokes in place of the face of the wheel, and when the rim was on, it looked like a rail fence. Then finally they would decide that the tire would bring the rim up to its place. So it will, to a certain extent, but after that is done, the tenons are all strained, and if your customer sees the job, before the tire is set, he isn't satisfied with it. It is just as easy to have a wheel true and straight before the tire is set, that is, if you know how. The tire and the wheel will do their part, if we do ours.

I can remember the time when the talk was that a Sarven wheel could not be repaired, and I find it is the easiest wheel to repair that I have. The only secret is to use spokes exactly the same size that were first in the wheel, as these spokes run in sixteenths of inches, and a size smaller or a size larger will make a poor job. Be sure to get the right size spokes, and cut out the rivets through the flange and drive the spokes in glue. Then put in new rivets.

I have taken light buggy wheels, that were badly dished, and put on new rims, where the spokes were solid in the nut and sound, and by driving them on tight as they will bear, without splitting the rims, it will take the dish out of the wheel. But if the rim is driven on loosely it will not take the dish out of the wheel. Cut off the ends of the spokes nearly an eighth of an inch below the rim so the tire won't bend them.



TOP VIEW OF A HEAT TIRE TIGHTENER.

From Toil to Fame.

There's many a patient toiler
  Who works for a higher life—
Who knows when he'll be the victor,
  And rise from the irksome strife?
No matter how plain his person,
  It houses a lofty soul;
A stout heart beats, and a great brain plans,
  A way to reach the goal.

Perhaps where you hear the rumble
  Of the giant wheels that turn,
Perhaps where you see the glowing
  Of the furnace fires that burn,
There 'mid the din and the tumult,
  In the dust, the grit and the grime,
A kingly man of a crowded world
  Toils on and awaits his time.

Whenever he heats a rivet
  And batters the fiery red,
The clang of the steel is singing
  To him of success ahead;
Although there's a cloud o'er his visage,
  His beaming smile comes through,
And his eye is bright with a future light
  That will help the world anew.

As sure as the earth swings onward
  Along its endless way,
As sure as the sun is shining
  He'll climb to the top some day;
And the world will go to greet him,
  And praise and cheer his name—
He'll reign supreme in a million hearts
  And mount the throne of fame.

—Geo. R. Harrison, in Popular Mechanics.

HEATS SPARKS WELDS

Do it now.

Ready for hot weather?

It pays to pay attention to details.

Coal is an important factor in the smith's work. Is your coal all it ought to be?

Chaos reigns supreme in many shops—take time to put things in order now and then.

Having trouble with the engine? Send us the details of it and we will try to help you out.

Don't hide your trade under a bushel. Advertise yourself, advertise your shop, advertise your business.

Good blacksmiths always keep a supply of coke on hand to use for welding, annealing and hardening heats.

Spring's here, roads are good, time to think about getting together with brother smiths to discuss the question of better prices.

The biggest searchlight in the world is to be seen at the World's Fair. It is of 5,251,000 candle power, weighs four tons and throws a beam of light seven feet in diameter.

When a job comes in that requires a large number of duplicate forgings, get up a tool or former to make them mechanically. Make the head save the hand.

When hardening, remember to heat, not too fast, nor yet too slow, but uniformly, above all things. Much cracking is due to uneven heating.

Sixty little minutes and an hour's gone. A full appreciation of the value of the spare moments, the minutes betwixt and between, will add perhaps a day to each week.

The long-time rates for subscriptions two, three, four or five years in advance have proved very popular with our readers—they appreciate the saving. See the advertising columns.

Dear at any price is the machine that is continually breaking down, a constant expense for repairs and in lost time. It is a good plan to pay a little more and get a good article to start with.

'Tisn't always how hard or how long a man works that determines how much he makes. A man may work a week and profit nothing, because his figures are too low or because he grants credit unwisely.

A little paint judiciously used by the repairman often goes a long way towards making a satisfied customer. It always pays to turn out neat work, if only to strengthen one's reputation as a good mechanic.

Several readers have taken advantage of our offer of advice on horse ills.—See Queries, Answers, Notes at the end of the reading pages. If there are others, let us hear from them. Always glad to help.

Many journals offer substantial reductions in rates to those who subscribe for a term of years in advance. Have you noticed THE AMERICAN BLACKSMITH'S long-time rates—a saving for any number of years up to five.

Your shop—is it well equipped or conveniently arranged? Send in a photograph of its interior, so that brother smiths can have a peep at your work-a-day home. Good photographs, like good stories, are always interesting.

Don't forget that the Queries-Answers-Notes-Department is open to all readers for questions, answers, criticisms or comments on any craft topic. Some brisk controversies are going on there now. Do you agree with what is said? If not, what is your opinion?

Your bill-heads, letter-heads, and other printed matter represent you. Let them at all times be neat and well printed. Those who do business with you from a distance know you from your stationery. In such cases is it all the more needful to have it just exactly right.

Times are changing. Blowers take the place of bellows, the old brick forges give way to steel ones, engines take from the smith much of the former severe manual labor. The movement is in the direction of better tools and more powerful machines, and real, solid progress it is.

Another side line is told of in another column. The smith in question uses his power, in this case a water wheel, to grind apples and make cider for the farmers round about. Who knows of some side lines out of the ordinary, but which other smiths could take up with profit to themselves? Let us hear about them.

A new metal similar to aluminum, but still lighter, has recently been discovered, and called "nodium," after the French engineer Albert Modon, who first separated it. It is manufactured by an electric process, and in color, lustre and structure is almost like steel. The inventor expects numerous uses for the new metal, but principally as castings in place of bronze, German silver, and similar metals now used.

Something-may-turn-up land is where many a smith lives. He goes on working hard in the heat of the forge, but he reaps little. His children are deprived of many advantages which his labor as a mechanic should entitle them to. And as the bills from his jobber come in with painful frequency, he labors on in the hope that something may turn up. Why doesn't he take matters in his own hands and start a movement for better prices and improved conditions in his locality?

Tom Tardy's buggy is surely a sight to behold. The shafts would never be accused of being brothers, the top looks as if it might have sheltered Noah at one time in its history, the wheels are all badly dished, and the whole rig rattles so you can hear it for blocks. Tom stoutly swears he can repair it if he wants to, but "what's the use?" says he. Perhaps after all his buggy is plenty good enough for him, quite in keeping with shop, tools, and owner, so why waste time in repairs? Tom evidently doesn't believe in giving his customers an incentive to have their own rigs fixed up.

A gigantic iron statute of Vulcan, the blacksmith god of the ancient Greeks and Romans, will be an interesting exhibit at the St. Louis Fair. It is being made at Birmingham, Ala., its purpose being to indicate the resources of that district. Fifteen big castings weighing in all 100,000 pounds, compose the figure of the fifty-foot giant, and seven freight cars will be required to convey the monster to St. Louis, where it will be set up in the Mines Building. Its total height is fifty-six feet, length of arm ten feet, weight of hammer 300 pounds and total cost, twenty thousand dollars. After the Fair, the statue will be removed to Birmingham for permanent location.

In Australia, American wagons, buggies and carriages are used, but the greater portion of such vehicles are made in Australia and differ in style and form from those made in the United States. There are heavy, broad, four-wheeled wagons used for transporting heavy material and large loads of grain and skins, but the greater part of the hauling is done on two-wheeled vehicles. Bread wagons, milk wagons, ice wagons, delivery wagons, carts and drays are almost all two-wheeled, drawn by one horse. These are much broader in the box and tread than the American. The lighter vehicles vary in tread from 4 feet 8 inches to 5 feet 2 inches. It is said that vehicles made from Australian wood withstand the severe heat of that climate better than the American, yet manufacturers import great quantities of hubs, spokes and rims, which they work into buggies and sulky carts and carriages. There are no less than 140 shops where vehicles are made, some of them quite extensive, though most of them are of the primitive kind, manufacturing by hand, as was done in the United States fifty years ago, except that ready-made material from the factories of the United States is largely used.

American Association of Blacksmiths and Horseshoers.

A very lively interest is being taken at this time in the work of the Association in many different localities. A great many smiths have requested appointments as organizers for their respective counties, and with the improved conditions of roads, prospects are bright for many new county organizations at an early date.

No time can be more favorable than the present for taking up the work of organizing. During the coming months meetings can be called without fearing the drawback of bad roads, which often cause poor attendance in winter. Send for our outline of plans for taking up the work. Talk better prices to your neighbors and get them interested. The more that take hold energetically, the quicker will the work of organizing be accomplished. Any body of smiths can get together, whether it be in city, township or county. Where the county is large we recommend that it be taken by halves, especially if there be any natural dividing line running through it.

Blacksmiths and wagon builders should remember that organization is now the order of the day, a necessity of the times. There is no prosperous craft which is not organized more or less completely. Take any of the trades and professions, machinists, carpenters, masons, lawyers, doctors; they all have their organizations and societies for mutual benefit and advancement. Banding together should not and does not restrict competition, but it does away with the evils of ruinous price cutting. Many craftsmen have the idea that if they join an association they must charge exactly the prices agreed upon. Under the plans of THE AMERICAN ASSOCIATION, simply a minimum price schedule is agreed upon by the members of each county branch, and no smith is permitted to do work for *less* than the prices so fixed. He is of course at liberty to get as much higher prices as his skill and reputation will bring him.

Again let us urge the importance of taking up the work without delay. Small beginnings often lead to large results; some of the largest of fraternal orders started with but a mere baker's dozen. There's everything to be gained and nothing lost. Figure how much more a year a slight raise all around will mean. Any reputable, energetic smith in any county can act as our representative.

We regret to say that our New York State Lien Law failed to become a law. The bill, as introduced in the Senate for us by Senator Davis early in the session, passed that body in March, and from there went to the Assembly. In spite of our efforts, it was impossible to get the measure reported out of the Assembly Committee on General Rules, in which Committee it died during the rush of the closing days in the middle of April. We do not intend to relax our efforts, and will endeavor to secure the passage of the bill at the next session. We want to thank the blacksmiths of New York State for the efforts they made with us for the bill. We feel we can count on even stronger support from them next winter.

The following are the officers elected at a late meeting of the Cayuga County (N. Y.) Branch Association: James H. Cole, President; E. M. Babcock, Vice-President; Charles Hutchings, Secretary; Benjamin Hutchings, Treasurer.

Should We Not Protect Ourselves?

J. W. BUETTNER.

In the March number of THE AMERICAN BLACKSMITH, under the heading "American Association of Blacksmiths and Horseshoers," I find one of the many questions which greatly affect the craft's welfare—What about the botch workman? I have read all about the other things, but haven't as yet seen that question brought up for discussion, so I will come out and answer it to the best of my knowledge and experience of thirty-two years.

Now I ask, should not a mechanic be protected from these so-called mechanics that know nothing of the trade? I say, yes! But if we cannot do it by organization we must do it by law. As we have no law to this effect, I say let us band together and bring this before the Senators and Representatives of our different States, asking them to make it a law that every blacksmith and mechanic must go before a board of examiners, appointed by the different States, to pass a rigid examination before said board, and then get a certificate. Those that are not able to pass, let them go back and learn, or else take up some other work, and let them not have the right to botch their work and defraud their customers.

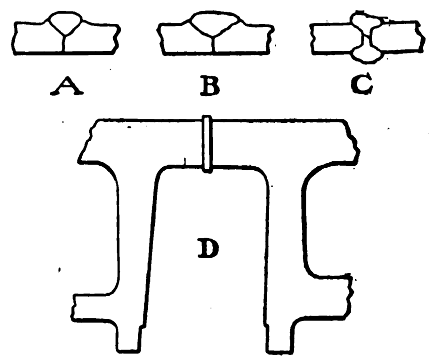
Now, some of my brothers may say that I am very strict and that my plan might interfere with some of our laws, for this is a free country. But I do not think so. Is it right for a man to say he is a blacksmith and then prove that he is not one? What guarantee does a smith give that he is a smith?

Our trade is an honorable one, just as much so as a doctor's or druggist's, who have to pass an examination before they can hang out their sign, and they have a certificate to protect them. But under what protection are we?

Repairing Locomotive Frames of Cast Steel—2.

A. W. McCASLIN.

After the frame is cast, machined and placed in position, what have we of any value or that can be vouched for aside from proper design and dimensions? Placed in service, we await results, which frequently means a loss that some of your gentlemen can compute more easily than I. It is simply the addition of cost of repairs to that of engine out of service through broken frame. Some might ask at this point, will a given number of steel frames show a greater number of breakages than will the same number of good fibrous iron frames, doing same service under same conditions? Will say that I have recently learned that on one of our neighboring railroads, they have, within the last six months, had thirty-five steel frames break on their engines of the consolidated class, and only one wrought iron frame broken in the same length of time. This great



WELDS FOR LOCOMOTIVE FRAMES.

number of failures in the steel frame in such a short period of time, would probably cause one to think some of these breakages due to improper designing of frame. If this be true, who of us would care to take the responsibility of having placed an incompetent man at this very important or we might say, one of the fundamental parts in the construction of locomotives? Has any one ever known such a number of broken steel frames to be paralleled with a like number or breakages in good fibrous iron frames, doing like service, under similar conditions, in the same length of time, even when the steel frames in service have been outnumbered by the iron frame from three hundred to four hundred per cent., including, as this would, those improperly as well as properly designed?

I hear many complaints from foreing smiths on many of our railroads as to the

great number of breakages in steel frames, which would indicate that wherever the steel frame goes, trouble accompanies it. How shall we repair this broken steel frame? As a blacksmith with thirty-five years' experience in the manipulation of iron and steel, I know but one proper way, that of laying in the side "V" weld, sometimes called the angle weld. In the preparation of parts for this style of weld, the sides of frame at breakage should be driven well back, in order to gather sufficient stock for upper end of wedge piece to properly weld upon. This weld is generally made at an angle of 90 degrees (A), but I think an angle of 110 degrees (B) better, as it requires a longer lap to make a secure weld in steel than it does in iron, and with the obtuse angle, the piece laid in is less liable to slip or drive past its first contract with the walls of aperture in the frame, and will weld by first blow from the hammer, there being less tendency to shear in the weld.

In welding broken steel frames and iron frames as well, the lay-in pieces are usually made of iron, and the fiber should always run with the length of back, limb or brace, according to location of breakage. This style of weld, made with a clean heat, we do not think can be excelled, but it should be remembered that any weld made with dirty or sulphurous fuel, is a counterfeit, and cannot be guaranteed, and I am pleased to be able to supplement this fact by saying that railroad officials, as a rule, do not long retain the foreman or his subordinate who knowingly jeopardizes the best interests of his company by placing in service articles showing faulty workmanship or unreliable material, which gives official recognition to the fact that a sufficiency of the best rather than a super-abundance of the inferior, is true or lasting economy.

We frequently hear of blacksmiths whose ingenuity and reasoning become entangled, and in their efforts to a speedy way out of their dilemma, resort to butt welding the steel frame, and by so doing, entirely disregard the nature of material they are handling, as well as the fact that a slow compression force will not effect a perfect weld, and even undertake to butt weld this frame without removing it from the engine, when their past experience and best judgment would teach that the most secure weld of any style requires a rapid succession of blows.

The method of butt welding the steel frame without removing it from the engine consists of separating it at breakage and inserting a piece of wrought iron which should protrude from one-half inch to one inch on the four sides of frame,(D). A furnace from eight inches to twelve inches square is then built around the broken parts, and air and oil used as fuel. When the broken part arrives at proper welding heat, if it is impossible to use battering ram, which is generally the case, the frame is pulled together at weld with screw rods, or some other equally slow means, and the parts dressed up with light hammers, and the butt welds, for there are two of them, one on either side of iron inserted, are completed, but with this method of welding, only the first installment of expense in the repairs of the frame has been met. A combination of the angle and butt weld would be preferable, (C). Were it possible for this butt weld to remain intact, the frame would break on either side of the weld, through the fact that this steel casting, even after it has been annealed, is in a raw condition, and every square inch of this steel encased in the furnace for the purpose of heating the parts for making the weld, be the furnace six inches or twelve inches long, is brought to the same high heat required to effect the weld, and when this weld is accomplished, this metal of granular or crystalline structure is left in a more open, spongy, as well as over-heated condition, which, through lack of hammering or lamination of any kind, is invalidated for service.

If there were no impurities and defects in the frame, and it should break through the solid, how can be expect good results from a weld with a tensile strength of only sixty to eighty per cent. of the original strength of the material, the lap or angle weld being the only weld that can be guaranteed to approach the initial strength of bar or frame? One might ask what the verdict would be regarding our sanity as to proportions and mechanics in general when we pretend to repair this broken frame by drilling it full of holes and bolting on a patch with a sectional area equal to only one-half that of the broken section.

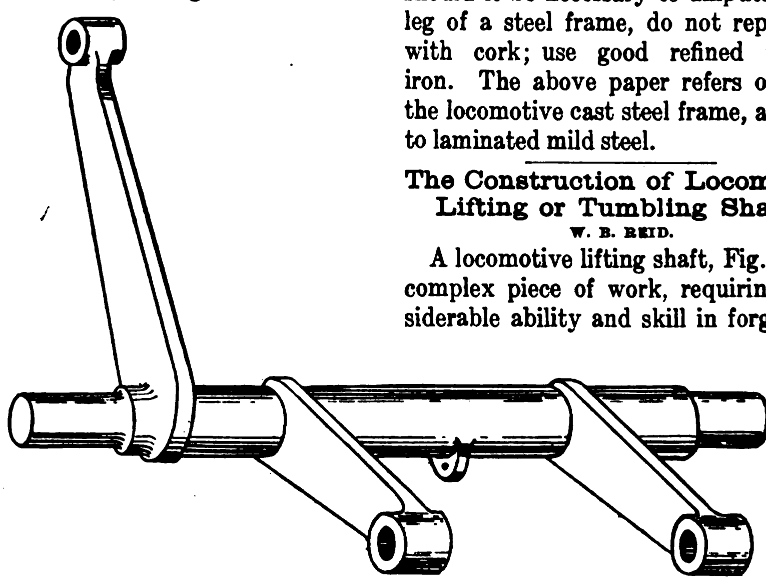
If we must have the steel frames with their present failures, we think the proper place to repair not only them, but the iron frame as well, is in the blacksmith shop under the steam hammer or on the anvil, making the best weld known, the lap or angle weld, paying strict attention to expansion and contraction of all the parts to avoid transmitting an undue strain to the limbs, which also include the braces.

If the disease calls for quinine, we believe in administering quinine, but should it be necessary to amputate the leg of a steel frame, do not replace it with cork; use good refined fibrous iron. The above paper refers only to the locomotive cast steel frame, and not to laminated mild steel.

The Construction of Locomotive Lifting or Tumbling Shafts.

W. B. REID.

A locomotive lifting shaft, Fig. 1, is a complex piece of work, requiring considerable ability and skill in forging it.



FORGING A LOCOMOTIVE LIFTING SHAFT.

In contract shops where they have to be turned out in large numbers, quickly and cheaply, they are often made entirely of bar iron; the shaft from round rolled bars, and the arms from flat bar iron, of suitable sizes. Considering that the work of a lifting shaft is not of a constant and violent nature, a good substantial job can be produced in this way, the workman being competent and conscientious. If he is not so, it matters little what method is followed.

The shaft being cut to suitable length, is held by a heavy pair of tongs, yoked with hand lever for steadying and turning the piece in crane. A bottom swage, large enough for shaft to fit in anvil block, is also necessary.

The first operation is to weld the small lug in the middle of the shaft. A scarf is formed in the shaft with fuller, and the

lug scarfed to correspond, Fig. 2, A. This is easily welded in place.

From this lug as the center of shaft, locate the position of the first arm to be welded on. Take a good short heat at this point and upset well with a light ram, suspended conveniently at anvil. This will secure a sufficient margin of stock for welding and working purposes. Scarf at this point by cutting out a small piece and enlarging the cavity with fuller, in semi-circular fashion around shaft, as shown at Fig. 2, B. The arm is scarfed to suit, as shown by its front and side views. In scarfing this arm do not cut out any of the stock. A medium sized fuller is driven down in the center as at Fig. 3, A. This augments and forces the stock out at both sides in a fin-shaped scarf. Turning the arm upon its side, this scarf is then extended towards the points with fuller, as shown at B. Re-heating the scarfed arm slightly, and placing it in the scarfed shaft, a few blows of sledge adjusts the parts neatly to each other.

In welding, the arm is driven vigorously into place with a few blows of the

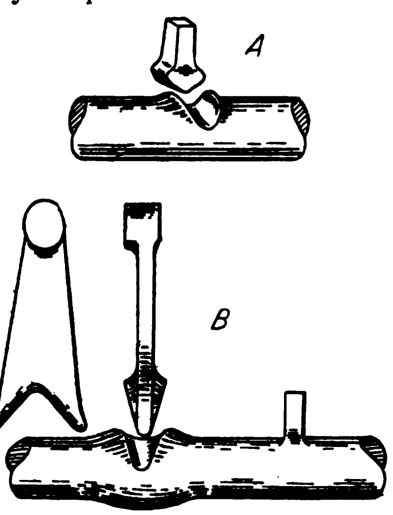


Fig. 2. SCARFING FOR LUG AND ARM.

sledges, then turned upon its sides to weld the points of the scarfs. Two fullers are then quickly applied, simultaneously, to put in the scarfs around shaft, the helpers striking regularly in unision. The fullers are quickly followed by a swage, or a pair of narrow swages (Fig. 3, C), nicely rounded on the edges to preserve the fillet around the base of arm, and at the same time smoothing the round surface of the shaft. This swage should have a slight bend at neck to throw the head of tool back from arm while being struck by helper, as at D, Fig. 3. The fullers, first used in putting in the scarfs, will also prove the better adopted for this work if rounded slightly to the circumference of the shaft. See Fig. 3, E.

The welding of the arm is completed by welding a piece of 1¼-inch or ⅜-inch iron around the back of shaft, catching the points of the scarfs of arms at

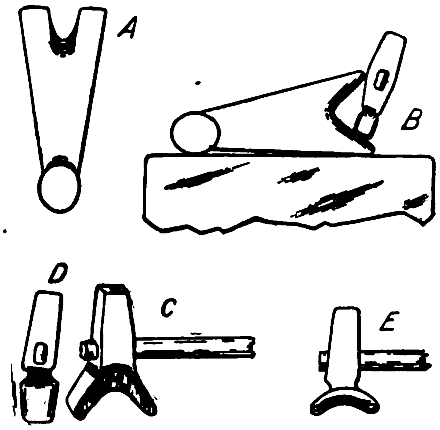


Fig. 3. SCARFING THE ARM. SWAGE AND FULLER.

either sides. This can be done in two heats, and binds and finishes the welded arm in good shape.

(To be continued.)

A Handy Device for Swinging Chucks.

BACKWOODS MACHINIST.

The sketch herewith shows a handy way of taking off and putting on a chuck or face plate of a lathe, and holding it when off. When you want the chuck on, swing the crane around over the lathe bed until hole in chuck comes level with spindle. If not quite level, raise or lower chuck with lever nut. When chuck is partly on, stop lathe, take hook out and swing crane back out of the way. Then start lathe and screw chuck on all the way.

For handling heavy chucks and face plates, this rig is very convenient, much more so than a chain hoist, and it beats three men in lifting a chuck and putting it out of the way where you can get it when wanted. For a 14-inch chuck the crane should be made of 1¼-inch iron. Let the bottom end into a socket or block in the floor. The top fastening is a bracket or brace fastened to the bottom edges of the bed. The hook should be made of ¼-inch iron; this rig will save all kinds of smashed fingers and back-aches caused by lifting the chuck off the floor six or eight times or more a day, also one to two men when a heavy chuck is to be taken off or put on, to say nothing about time, which generally amounts to quite an item in most shops.

To make any shop turn out the greatest profit, the little details must always be looked after. It is surprising how many little leaks can be found if they are carefully looked into, the pay roll, the stock purchases, in wasted materials. In small shops the boss can well devote some time as an inspector.

A Serviceable Tool.

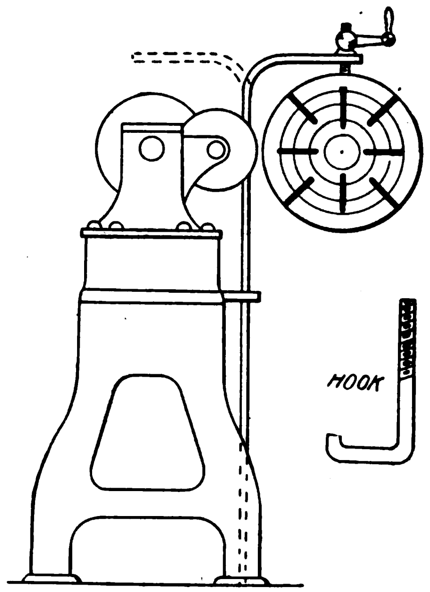
JOHN STITZER.

The following device will be found very easy to make and very handy where there is heavy machinery. The principal part of the tool is a large turn buckle. From one end projects a rod, one end of which is threaded to screw in or out of the turn buckle. The outer end of the rod is shaped with a hook on it. Another similar rod is made to screw into the other end of the buckle, and on the far end of this an eye is formed. Fastened in this eye is a ⅜-inch chain three long with a hook on its end, completing the tool. The various parts may be made of any convenient lengths and the tool will be found quite powerful for moving heavy pieces.

Tongs of Special Merit.

T. B. HULME.

The pair of tongs shown in the accompanying figure were to me of more practical value than any other kind I ever saw, as they will hold anything rigidly with no slipping, either round, square, oval, flat or even a wedge shape. They are simply a straight-lip tongs, with one long lip and one short one. The long lip is left about ½ inch thick at the end and bent in square with a notch cut in the end as shown. A piece



A CHUCK-HANDLING DEVICE.

of iron ¾ inch thick by ½ or ⅝ inch wide, and as long as the lip of the tongs is wide, is welded to the back part and has a notch worked in it to correspond to the front end. The short lip is made exactly like the long one, except that it has no rear piece. It reaches half way

between the two projections on the long lip, as indicated. This makes a pair of tongs which will give three bearings on any shape of rod.

A Treatise on Horseshoeing.—4.

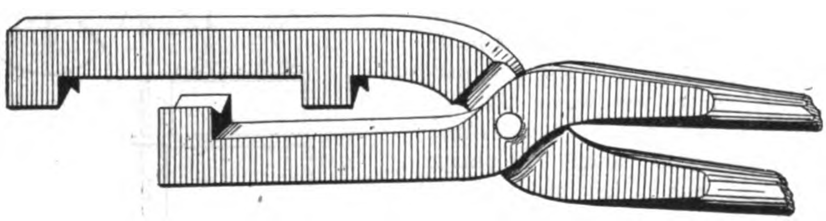
JOHN W. ADAMS, V. M. D.

The Shoe.—Preliminary Examination.

The object of the examination is to ascertain the direction and position of the limbs, the shape, character, and quality of the hoofs, the form, length, position, and wear of the shoe, the number, distribution, and direction of the nails, the manner in which the hoof leaves the ground, its line of flight, the manner in which it is set to the ground, and all other peculiarities, that at the next and subsequent shoeings proper allowances may be made and observed faults corrected. The animal must therefore be observed both at rest and in motion.

At rest, the observer should stand in front and note the slant of the long pasterns. Do they drop perpendicularly, or slant downward and outward (base-wide foot), or downward and inward (base-narrow foot)? Whatever be the direction to the long pastern, an imaginary line passing through its long axis, when prolonged to the ground, should apparently pass through the middle of the toe. But if such line cuts through the inner toe the foot axis is not straight as it should be, but is broken inward at the coronet, an indication that either the outer wall of the hoof is too long (high) or that the inner wall is too short (low). On the contrary, if the centre line of the long pastern falls through the outer toe the foot-axis is broken outward at the coronet, an indication that either the inner wall is too long or the outer wall too short.

The observer should now place himself at one side, two or three paces distant, in order to view the limb and hoof in profile. Note the size of the hoof in relation to the height and weight of the animal, and the obliquity of the hoof. Is the foot-axis straight? that is, does the long pastern have the same slant as the toe? or does the toe of the hoof stand steeper than the long pastern (Fig. 6*c*)?—in which case the foot-axis is broken forward at the coronet, an indication, usually, that the quarters are either too high or that the toe is too short.



HANDY TONGS FOR ALL AROUND WORK.

If the long pastern stands steeper than the toe (Fig. 6*a*) the foot-axis is broken backward, in which case the toe is too long or the quarters are too low (short). In Figures 6*a* and 6*c* the dotted lines passing from toe to quarters indicate the amount of horn which must be removed in order to straighten the foot axis, as shown in Figure 6*b*. Note also the length of the shoe.

Next, the feet should be raised and the examiner should note the outline of the foot, the conformation of the sole, form and quality of the frog, form of the shoe, wear of the shoe and the number and distribution of the nails. Does the shoe fully cover the entire lower border of the wall? or is it too narrow or fitted so full on the inside that it has given rise to interfering? or has the shoe been nailed on crooked? or has it become loose and shifted? Is it too short or so wide at the ends of the branches as not to support the buttresses of the hoof? Does the shoe correspond with the form of the hoof? Are the nails distributed so as to interfere as little as possible with the expansion of the quarters? are there too many? are they too large? driven too "fine" or too high? These are questions which the observer should put to himself.

Note carefully the wear of old shoe. It is the unimpeachable evidence of the manner in which the hoof has been set to the ground since the shoe was nailed to it, and gives valuable "pointers" in leveling the hoof. Wear is the effect of friction between the shoe and the ground at the moment of contact. Since the properly leveled hoof is set flat to the ground, the "grounding wear" of a shoe should be uniform at every point, though the toe will always show wear, due to scouring at the moment of "breaking over." Everything which tends to lengthen the stride tends also to make the "grounding wear" more pronounced in the heels of the shoe, while all causes which shorten the stride, as stiffening of the limbs through age, overwork, or disease, bring the grounding wear nearer the toe.

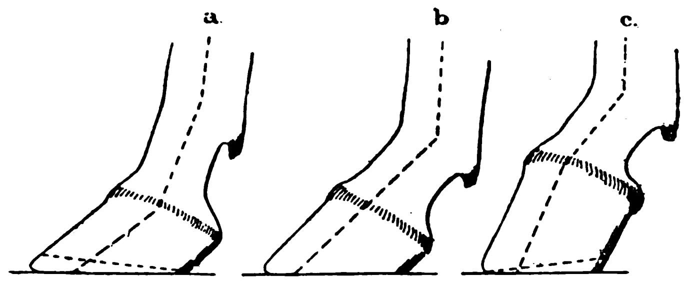


Fig. 6. LIMBS AND HOOFS IN PROFILE: *a*, Side view of foot with the foot-axis broken backward as a result of too long a toe. The amount of horn to be removed from the toe in order to straighten the foot-axis is denoted by a dotted line; *b*, side view of a properly balanced foot, with a straight foot-axis of desirable slant; *c*, side view of stumpy foot with foot-axis broken forward as a result of overgrowth of the quarters. The amount of horn to be removed in order to straighten the foot-axis is shown by a dotted line.

An exception should be noted, however, in founder, in which the grounding wear is most pronounced at the heels.

If one branch of the shoe is found to be worn much thinner than the other, the thinner branch has either been set too near the middle line of the foot (fitted too close), where it has been bearing greater weight while rubbing against the ground, or, what is much more often the case, the section of wall above the thinner branch has been too long (too high), or the opposite section of wall has been too short (too low). "One-sided wear, uneven setting down of the feet, and an unnatural course of the wall are often found together." How much an old shoe can tell us, if we take time and pains to dicipher its scars!

The horse should next be observed at a walk and at a trot or pace, from in front, from behind, and from the side, and the "breaking over," the carriage of the feet, and the manner of setting them to the ground carefully noted and remembered. A horse does not always move just as his standing position would seem to imply. Often there is so great a difference in the form and slant of two fore hoofs or two hind hoofs that we are in doubt as to their normal shape, when a few steps at a trot will usually solve the problem instantly by showing us the line of flight of the hoofs and referring them to the regular, base-wide, or base-narrow form.

No man is competent either to shoe a horse or to direct the work till he has made the precited observations. Almost every foot and limb will be found to vary, so that no shoeing can be intelligently done until an examination has been

made of the case in hand. Examination of horses in action is not practiced nearly as much as it should be by farriers today.

(To be continued.)

A Few Hints on Interfering.

W. B. ALLEN.

Interfering may be defined as the striking of one leg by the opposite foot as the animal travels. The part most often injured is the inner surface of the fetlock joint, and more generally in hind than in fore legs.

Of the many causes of interfering may be mentioned the following: Defective shoeing, bad roads, too fast work, exhaustion, a swollen leg, high knee action, and too narrow chest or hips. Perhaps the most common cause, however, is faulty conformation when the horse toes in, or when the fetlock joints are close together and the toe is turned out, the leg being so deformed that the ankle and foot turn in or out, and interfering is almost bound to result.

Interfering can be detected usually by the swelling or bruise at the part that is struck. In some cases, however, especially with trotters, little or no visible injury is done, so that interfering is only noticed by an occasional tripping. To make sure in such cases, resort may be had to painting the inside toe and quarter of the striking foot with mud, paint or chalk, and then driving the animal.

Having discovered the offending foot, treatment follows. The first step, of course, is to remove the cause, when this can be done. In cases where the trouble is due to the conformation of the legs, this may not always be possible, and then the only thing to be done is to apply a fetlock or ankle boot and admonish care in driving. When the trouble is from fatigue or exhaustion, the boot is also to be used till recovery.

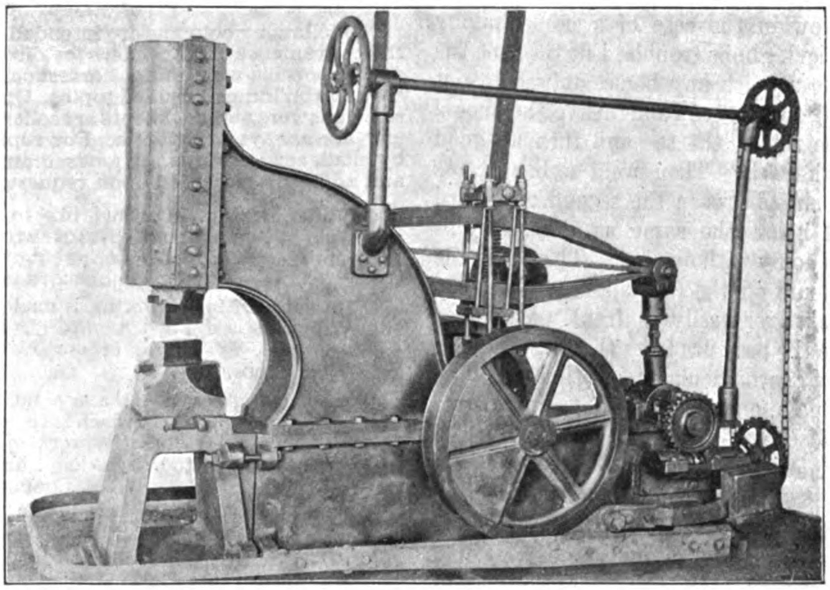
When shoeing to correct interfering, lower the outside heel and quarter on the leg that is struck. The aim is to bring the fetlock joint further away from the center line of the body, and thus allow the offending foot to pass without striking. Care should be observed in this lowering the heel and quarter, because very often a slight change only is necessary to produce the desired result. In shoeing the foot that does the striking, set the shoe well under the hoof at the point where it hits. Reset about every four weeks.

Having removed the cause we may treat the local wound that has been caused. Soreness and swelling, if not of too long standing, can often be reduced by cold water bandages. If the fetlock is calloused from long-continued bruising, apply a Spanish-fly blister at that part, repeating in a couple of weeks if necessary.

Some Indiana Prices.

L. G. CHAMNESS.

Four old shoes, reset	$ .60
Four old shoes, toed	.80
Four shoes, new, toed or plain	1.00
Four new shoes, Neverslip toe calks	1.40
Plow lays	2.00
Plow shares, sharpened	.15
Buggy tires, reset	1.40
Buggy tires, new	3.00 to $4.00
Wagon tires, narrow, set	1.50
Wagon tires, 2½ to 3½	2.00
Buggy and wagon spokes, all sizes	.12½
Buggy rims, all sizes	3.00
Wagon rims, heavy	5.00



A NEW BELT POWER HAMMER.

A New Power Hammer.

The accompanying engraving shows a hammer recently put upon the market. It weighs 4500 pounds, occupies a floor space of 7½ by 3½ feet, and it is adapted to work iron from ½ to 5 inches thick. Two hundred and seventy-five blows per minute may be struck by it, and the power required for driving is estimated at 2½ or 3 horse-power.

The ram has a long bearing, as shown, and the construction is such that the hammer head gets away from the work quickly after striking. The anvil block is separate from the bed, and the lower die may be adjusted in any direction.

Among the novel features of this hammer is the means of shortening or lengthening the fulcrum quickly by means of the handwheel chain and worm gear. When a large piece of work is put on the anvil, the dies can be thrown open wider, thus securing the maximum stroke and blow on large work.

In the same way a very light blow can be had on small pieces. The elliptic spring helve cushions the ram, permitting a light elastic blow, while running at a fairly high rate of speed. The hammer is made by Austin Bragg, Waterville, Me.

Some Ideas on Horseshoeing.

Interfering—Knee-knocking—Forging—Navicular Disease.

J. B. CLARK.

The following gives some of my experience and ideas on horseshoeing: The first thing which I do when I have a horse to shoe, is to look at the feet as the horse stands on the floor. Pare his feet as nearly level as possible. When a horse interferes, pare the feet level, and if there is any rolling out to do, do it with the shoe. After the feet are level, I give the shoe a square inside toe and fit as closely to the inside as I can. You will find that in nine cases out of ten, horses interfere with the toe about half way back. Straighten the shoe from the toe back to the last nail hole slightly, then cut away a little of the foot on the inside, making the job as smooth as possible. If the case is a bad one, don't clinch your nails on the inside of the foot.

Now a word about knee-knockers. I give my shoe a square outside toe and let the shoe project over about one-half an inch at the outside point of the toe. Having given them a perfectly square toe on outside, I roll the inside of the shoe, so as to make the horse break over

on the inside of his foot. This plan has given good satisfaction.

Forging is the hardest thing with which I have had to contend. I have, however, had good success with forgers, since I learned this way of shoeing them. I cut the front foot as low as it will stand at the toe. Then I give my shoe a rolling toe with the heels a little thicker. If I am using calks, I weld the toe calk as far back on the web of the shoe as I can with good heavy heels. With the hind foot, I leave the toe as long as possible and set the shoe far forward. If calking the shoe, I weld the calk well toward the front of the shoe, making it a little higher than the heels. You will find this a good plan to follow.

Now in the case of a horse having navicular bone trouble, I fit the shoe the same as with any horse, only I do not weld on any toe calk. Give the shoe a little roll at the toe and turn up good block heels. Then weld a bar across the shoe between the second and third nail holes, the same as the Memphis shoe, only with one bar. This takes the pressure off the frog and lets the horse break over easily in front. When we take the pressure from the frog, we take it off the navicular bone, thus relieving the pain, and the horse will grow better in time.

I have worked at horseshoeing since I was seventeen, and have made the horse's foot a study. I think if some of us would study the foot more, we would find it very interesting. I think there is a great deal of good to be found in the horseshoeing journals.

Special Notice to Subscribers.

If you find a bill in this month's paper it means that your subscription has expired. In that case, won't you kindly treat the bill as you like to have the bills you render treated and respond promptly with your remittance? We always appreciate the prompt renewal of a subscription when it expires. It encourages us to think the paper is liked and to try and give readers a still better issue each month. Therefore, if you find a bill, we would greatly appreciate stamps or a money order in payment, the same day, before it is forgotten.

We want each reader of the American Blacksmith to feel that it is *his* paper, and to take an interest in its betterment. Since the American Blacksmith entered the field and set a high standard of blacksmithing journalism, other like papers were forced to improve or go under. The publishers of the American Blacksmith are not content with merely occupying the foremost position; they desire to make the paper more and more valuable. Readers can help by asking for any kind of articles they want, by giving their experience for the benefit of others, and by promptly renewing their subscriptions.

Queries Answers Notes

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Cylinder Boring.—I would like to see published in The American Blacksmith, a plan and sketch of a tool for boring out cylinders. C. L. Higginbotham.

White Rock Hoof Packing is made by the Wilbur Stock Food Company, Milwaukee, Wis., as several of our readers kindly inform us.

Horseshoeing Rack—I have a rack of Hunt, Helm, Ferris & Co., which is the only one in the city. It does the work of six men when it comes to bad stock. I highly recommend it. W. M. Cooper.

A Tempering Question.—I would like to ask through the columns of The American Blacksmith the best method for tempering cultivator shovels. A. Schuetz.

Drawing a Sleigh Shoe Temper.—I would like to ask of some brother blacksmith how to draw a temper from a case hardened sleigh shoe, so as to bore a hole through it easily. A. H. Blum.

Sand Belt Query.—Will some brother smith kindly send in a plan and sketch of how I could build a cheap sand belt for polishing all sorts of bent wooden pieces, such as felloes and other carriage and wagon wood work? T. L.

Spokes.—In answer to A. J. Rooks, would say shallow gauge the end of your spokes, thus letting the tire rest on the rim and the latter to settle snugly on the shoulder of the spoke. This, notwithstanding Mr. Dickson to the contrary. R. O'Hearn.

Power Hammers Pay—In reply to Indiana, my experience with power hammers is just like with gas engines—didn't think one would help me much before I put it in, but once having one I wouldn't do without it for a good deal. A power hammer is worth two or three helpers almost, and will do any amount of heavy work. I have a great deal of plow work, and on this just couldn't get along without my hammer. I can strongly recommend the power hammer for smith shops of whatever kind. S. M. Leech.

The Gas Engine as Power.—In answer to the question "Does the gas engine as power pay?" would say yes and especially in the convenience in handling the work to be done. It is all that is required outside of machinery and the man's fitness for the work. The engine must be a Weber, according to my experience. A. B. Ellsworth.

Tire Setting.—John G. doesn't say what kind of tire setting is giving him trouble. A buggy tire with $\frac{1}{8}$ inch draw, hot in one place, and wheel sound and straight on the face, will do well enough. If the wheel is back a little, then a little open joint, $\frac{1}{8}$ inch, and $\frac{1}{4}$ draw cold, or $\frac{3}{16}$ hot in one place. Try this. Richard O'Hearn.

The Gas Engine—I wish to say a few words in regard to the gas engine. I think it is used in most shops because it is cleaner, takes less room, and saves expense for fireman, engineer, and fuel. It takes less time to start, is less dangerous, and less expense for repairs. I consider it the best in every way. Chas. Arny.

Water Wheel Query.—Will some one tell us how to make a small water wheel to drive a blower for one fire, sixteen-foot head of water? Would a six-inch wheel run it if the floats were made of three-inch band iron? Our water wheel is 17 inches in diameter and will plane 5,000 feet of spruce plank per day. Otis Geding.

Pair of Dividers.—In answer to T. H. Long in the February number as to how to make a pair of dividers, would say, take two pieces of small round steel or iron, bring one end to a sharp point and flatten the other end. Rivet them and they are done. If you want a better pair, however, you will probably have to buy them. R. O'Hearn.

Flue Welding.—In answer to J. M. K. with regard to flue welding, I would say, try a mixture of five pounds of borax and one ounce of Venetian red. Apply in fire while heating. This is the best mixture that I have ever seen for applying on the outside and I have had thirty-three years' experience. R. A. S.

Remedy for Knife Warping.—In answer to Samuel Krebbs as to how to prevent knife warping, when tempering, would say lay it on the end of a solid block of wood when drawing the temper, about the time the temper is what you want, and straighten it with the round end of your hammer. Don't be afraid to strike it, for it will then have enough heat in it to keep it from breaking. R. O'Hearn.

Gather—Mr. Foster must stand corrected. A vehicle moving forward or backward or even sideways never brings any appreciable pressure on the front or back of the axle. To do so the spindle would have to leave the bottom or under side of the box. All old spindles will be found to wear on the bottom, wearing to an oval, bordering on flatness. This being so, the rest of your argument is nil. R. O'Hearn.

Interfering.—I noticed in the March issue Mr. Bert Fields' inquiry on interfering. If the horse strikes with the toe, quarter or side of the foot, try a light shoe with the inside heel turned out and the outside heel fitted close. Pare the foot level on the bottom and fit the shoe full with the foot. Do not cut off edges of hoof. Leave plenty of toe. If it has been cut off already, let the shoe project over a little. If the roads will not permit the use of a plate, weld toe calk on inside of heel, ordinary calk on outside heels, putting toe calk a little to the inside of the centre. I have used this shoe successfully on livery horses that are driven hard all the time. R. A. S.

Wheel Work.—In answer to the question asked by Mr. Rooks in the February number, Mr. Dickson says with regard to wheel work that the tenon on the spoke should be left to come flush with the outside of the felloe. I have found in over twenty years' work that if I leave my tenon about $\frac{1}{8}$

of an inch short and then pin the felloes all tight except one, leaving one open space of ¼ inch, that when you give your tire ¼ inch draw, it will bring the tenon flush with the outside and make a good job, one that can be guaranteed for three years under almost any kind of a load. I think they will agree with me. C. W. METCALF.

Barcus Shoeing Racks—I wish to say in reply to a recent question that the Barcus shoeing rack is the best thing I have ever seen. I do not wish to say anything about the other shoeing racks, but I think the Barcus cannot be beaten. We have one in our shop that cost $65, but $165 would not move it out of our shop and compel us to do without it. We are frequentlv called upon to shoe Indian ponies, as well as some large horses that are very bad. MAYNARD & HARRIS.

New Machine Wanted.—I want to say through these columns that if some one could get up a machine run by power that would answer the purpose of punch and shears, tire upsetter and tire bender combined, it would be a great seller throughout the Northwest, because it would save so much room. CARL NORDHOUGEN.

A Canadian Letter.—I would not like to do without THE AMERICAN BLACKSMITH. I have worked at all lines of the trade, railroad shop, carriage shop, general jobbing and shoeing, and from the way in which the paper explains the different lines of work I consider each copy worth at least 25 cents to me. A. CAMERON.

Interfering Horses.—I have two rules which I follow. The first is that the foot or line must be straight from shoulder down to the toe and the other is not to drive the horse fast down hill, as he throws the weight all on his ankles and shoulders. To shoe the horse first fit the foot level, and turn the shoe to correspond to the foot. A. B. ELLSWORTH.

Tempering Gun Springs. — Mr. J. Summs, in order to temper your gun spring, heat it to a dark cherry and cool in linseed oil. (This is good enough, although I know a better). Then heat to a red a piece of hoop iron, lay your spring upon it and let both cool together. I will give you twenty-five cents for every one that breaks or weakens if you will give me a quarter for every one that stands,—your work being properly done. R. O'HEARN.

Prices.—A few words of advice which I wish to give on prices are as follows: Do good work and you need not fear that the good price you charge for it will lose you any worthy customer. I charge the highest prices of any smith in this town and I make my charges without any apologies. I credit a few for a week or ten days, but I *know them*. I have not lost $2 in eight years through crediting. R. O'HEARN.

A Shoeing Query.—I would like to ask brother smiths how to shoe a young mare that strikes a full blow with one foot only, causing her to go very lame at once, and continue lame for several days. She is in good condition. I have tried every way that I can think of, but without the desired effect. She travels wide when trotting, but in starting and stopping is very likely to strike one of those terrific blows. Can I shoe to stop it? INQUIRER, CANADA.

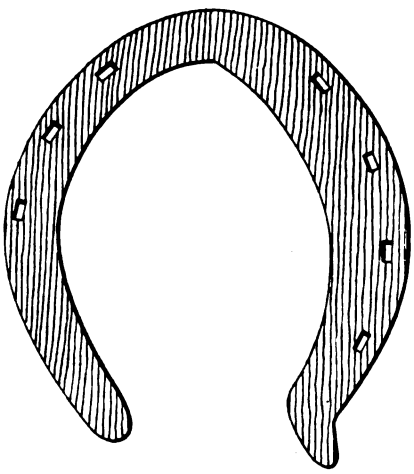
Tempering Knives.—The following is in answer to the inquiries of Messrs. Samuel Krebs and Thomas Long: In tempering so as not to warp the knife or any thin steel, heat to a good plain red. Then take from the fire in a pair of tongs not too heavy, hold by the side of the shank in the tongs and about two or three inches from the oil or water with the edge or back down. See that it is right before you let the point drop. Hang on to the shank of the knife and do not let it go in the bath. Melted lard is the best to temper knives in, as water will crack them if you do not put about two inches of oil on the water. THOS. A. MCKAY.

Wheels—In answer to the question of "No Nothing" in the February issue, would say that I have built and repaired wooden hub wheels, also the Sarven flanged wheel for a good many years. I have found from experience that a good wooden hub, such as white oak or birch, will surpass any flanged hub, for the simple reason that so many do not understand the repairing of the Sarven hubs. We have both kinds in the War Department and would say that the wooden hub gives the best satisfaction, as the rivets work loose in the flange and the iron flange will wear the spoke a great deal faster than a wooden hub. M. A. FOSTER.

Painting Questions.—When I open a keg of white lead and use one half and want to keep the balance for thirty or sixty days, will it do to cover it with water to keep from drying? When you use a torch to burn old paint off, do you have to scrape paint off while hot or do you burn paint all over the gear before you scrape any? KENTUCKY.

In Reply.—Keep the white lead perfectly covered, and change the water frequently. When burning off old paint, remove it while hot, as fast as it is burned. M. C. HILLICK.

To Stop Interfering—In reply to Mr. Cryce, to stop a horse from interfering behind, pare the foot level and fit neatly a shoe with the heavy side on the outside.



A SHOE FOR INTERFERING.

It may require a couple of shoeings to do it. In my experience this would stop any case of the kind. The figure is drawn from a hand-made shoe. JOHN MULL.

A Canadian Letter.—I am sending a dollar for my renewal subscription, as I cannot be without the paper. It is a great help to me. I run a general jobbing shop, do carriage and buggy building, repair wagons and sleighs, do horse shoeing and repair plows and machines for the farmers. We are going to raise our prices soon. What it will be I can not say definitely, probably 20%. ALEX BANNATYNE.

Some Kansas Prices:—The following give our run of prices:—

New shoes, per set of eight	$3.00
Resetting old shoes, each	.20
Sharpening plows	.35
Sharpening lister	.50
Pointing plows	.75
Pointing cultivator shovels, each	.50
New stubs up to 1¼ inches, per set	7.00

Soft center plow steel is the only kind of steel we can use for plow work. Blanks for plow shears cost us 18 cents per pound, and we get $3.50 for new lays up to 16-inch Lister lay blanks cost 25 cents per pound and we get $4.50 for putting on new lister lays. LOUIS L. RUHLEN.

Advice On Prices.—Mr. J. J. Mullen, you say you have worked at the business five years. We are not going to suppose that you know more about it than some who have worked at it longer, though you may. But supposing the case as we first put it, it is not reasonable to expect customers to stay or new customers to come, simply because you have put up the price. To command the best prices, unless you have a pull in the community that nothing can stagger, which does not seem to be the case, you must do the best work. Charge like the others until you can do better work. Stick to your shop if you think you can do better as you grow older. If not, get out right off and work for another man or at some other business. That's my opinion. R. O'HEARN.

Shoeing a Horse that Wings—In answer to Mr. Davies with regard to a horse that wings, would say that I have had some experience with that kind and I shoe them as follows: Weld a piece of iron five-sixteenths by one inch at the toe nail on the inside quarter of the foot that he wings and let it extend from the shoe three-quarters of an inch. If he is an extra bad one, let it extend out longer. I have found this successful. ALEX. HENDERSON.

Shoeing Forward Foot—In regard to the forward foot, which I have found to be the most troublesome, would say, do not cut the foot all away or burn the life out of it, as that seems to be the easiest way for some men to level a foot in fitting a shoe. My experience has been to fit the shoe as full as possible and let the shoe follow the wall on both of the quarters. To cover the two bars of a shoe is out of the quesion as the shoe settles down in the quarters and the result is the horse is lamed. I like a shoe heavy on the heels so as not to give. The heel calk should be a little higher than the toe calk and on a flat-footed horse very little filing should be done on the outside. Draw the toe nails first, then the outside and last the heel. GEO. D. ALBERTSON.

Interfering Horses.—In answer to Mr. Bert Fields with regard to his interfering horse, would say that he should pare the inside of the foot ⅛ of an inch lower than the outside. Then take a bar of steel 7/16 by ¾ and about twelve inches long, depending on the size of the foot. Mark off one third with the center punch. This point is the center of the toe. Draw the one-third long enough to fit the inside of the foot and bevel the edge starting at the center of the toe to a feather edge. Now shape the outside of the shoe, drawing a little at the heel. Turn the small heel calk on the outside, throwing it out a little, with no toe or inside calks. Fit the inside even with the hoof, not cutting any away. Fit the outside full, using toe and side clips. I have found this successful in many cases and hope it will prove so with Mr. Fields also. WALTER L. LONG.

Flue Welding—Replying to Mr. J. M. K., in March, just a thought would arise in my mind. First, what facilities has he for cleaning the inside of the flues? It may be that the coal used in firing the boilers is sulphurous, and that sulphur is adhering to the inside of the flue back of the scarf. When it gets hot the fumes going all through the part to be welded would produce such results. As to fluxes, I will say some twenty-five years ago I did work of this character. We would gather clean scales of the iron, around steam hammer or anvil, and mix it with sand. Any flux is good to exclude the air, thereby retaining the heat better. Oil of course is doubtless the best for heating. If this can help the enquirer he is welcome. J. L.

Barcus Horse Stocks—In answer to W. W. Herring's question in the February issue that he would like to hear from some one who had used the Barcus stocks, I have used them for two years and they are very good. I have been looking up the stock question for twenty years and the Barcus is the one which I consider worthy the name of stocks. When you get an animal in them, he is perfectly secure. The foot you are working on is as secure and solid as if fast in a vise, and you can put it just where you want it. For my part I do not like a set of stocks made up of ropes and blocks, as I find that a rope cannot be fastened in any way but what there is a lot of give to it. H. B. DUNPHEY.

Horse Racks—In reply to Mr. B. Q. Davis, two years ago I bought a Martin rack and find it all they claim for it and a little more. I have shod a horse of 600 pounds and one of 1,700 pounds,—no more trouble with one than the other. The horse cannot move his foot over four inches at the most. It works so well that I have had horses brought for miles to be shod, and all my customers are very well satisfied. I recommend the Martin rack by my own experience. GEO. D. ALBERTSON.

About Engines and Tires.—I am operating a shop 46 by 34 feet, having a 2½-horsepower Weber Junior engine, with which I am very well pleased. This engine runs a trip hammer, emery polishing wheel, one iron and one wood turning lathe, one blower, and one band saw, 26-inch, and a circular saw. The trip hammer and both lathe and band saw are of my own make. Most of the time I run the shop alone and find that by having all these machines can do more work than with a man. The Weber engine is just the one for a shop, and I would advise any blacksmith who needs power in his shop to get a 2½ Weber Junior. He will find it a good helper.

When I am putting new tires on wagons I start the engine, put the belt on the blower, heat the ends of the tire, take it to the trip hammer, and draw it out. Then I punch a hole in each end to rivet it together. It is now ready for bending. I then take and weld it. I heat all my tires in the forge fire. I have found this the easiest way when there is an engine to blow. I believe in having a handy shop, with good tools and machines. J. G. STOEN.

A Query from Georgia.—I wish to say that I really cannot do without THE AMERICAN BLACKSMITH. I would rather be without a helper than the journal, for sometimes I strike a job I could do without the helper but could not do without the paper. I wish to ask if there is any shorter way to find the length to cut a bar, say 1¼ inches diameter so as to stave it up and make it 1¾ inches diameter and four inches long. I have the old Sanford Rule. I would like to hear something on the subject.

I am really ashamed of the prices which the blacksmiths in this section work for. However, here are a few:

Setting tires, each	$ .40
Putting in hound	1.00
Wagon tongue	2.00
Cup pole	.75
Bolster, two	.75
Setting axles	.75
Rims	1.00
Horseshoes, four,	.70

You can see by these prices how hard we have to work in order to make both ends meet. J. E. MCLEROY.

Errata.—I note with some pleasure that my prize article has found a place in the April issue of THE AMERICAN BLACKSMITH. There are two points in the illustrations that are not exactly clear, and I will here correct them. On page 126, down in the first column we read. "Have a piece of straight iron two feet long bent up about ¼ inch on one end. Place this end under axle one inch inside of shoulder, (See Fig. 2, A). In Fig. 2, A, this bend is absent and cannot therefore be understood. By bringing that bar down, bar and axle move part and axle rests only on that bend. This is necessary to be comprehended to get correct results.

"In Fig. 2, C, where gage is set, the point of screw is way in on spindle. This is wrong. The point of screw should be directly over nut shoulder and the mark on wedge. In the illustration the outside end of gauge is just over place where point of screw should be. In other respects it is all O. K. Should criticism on other points arise, I will not leave them unnoticed if it be brought to my knowledge." C YOUNGSTROM.

A Chatty Shoeing Letter.—I wish to say that I desire to keep up with the times and I know of no better way than to be a regular subscriber to THE AMERICAN BLACKSMITH. I have received a great deal of information from the journal which has been worth dollars to me at a very small cost. If I did not receive THE AMERICAN BLACKSMITH once a month I would feel that I had lost a valuable friend. I am more interested in the horseshoeing notes than anything, although I do regular jobbing, yet horseshoeing is my delight. Therefore I am always pleased to read any notes upon that subject. Some time ago a brother craftsman wrote that he never knew of a pacer having navicular disease and asked that if any one knew of such to report. I had one at the time, but said nothing, as we had just performed an operation on her and desired to know the result. After giving the mare a reasonable time, I was pleased to find that the operation was very successful and in about three weeks I could drive her and, shortly, she was over her lameness altogether. She was a regular pacer, could strike a 2.25 clip and was eight years old. I sold her afterwards at a good figure.

At the present time I have a double gaited mare that has a mark of 2.25¼. She will trot or pace, whichever one wishes, and do it without a hitch, although she is a little the faster trotting. She has been a little tender in one fore foot. I shod her many different ways, but found nothing as satisfactory as the Revere Air Cushion Pad. She is going all right now and I entered her in a race on the ice, where we held our races in the winter.

In shoeing horses, I shod at one time without any assistance thirteen horses in 6½ hours, at another, fourteen in seven hours, and another, sixteen in eight hours. In doing this, I had all the shoes to take off and the feet to dress, also to renew the calks on four sets of old shoes, the rest being new shoes with the toes already welded, but I had the heels to turn. The above was done with satisfaction to my customers. I am pleased to say that I have had better success in horseshoeing since I have been a subscriber to THE AMERICAN BLACKSMITH and can explain more fully any questions asked by customers. A. P. WETMORE.

Knuckled Horses.—I would like to know regarding shoeing knuckled horses or horses about to knuckle, how the shoes are made and all the light which I can possibly get on the subject. GEORGE PINE.

In Reply to the question on shoeing knuckled horses, the following will probably be of interest. In the first place, knuckling is a partial dislocation of the fetlock joint which predisposes the animal to stumbling and to fracture of the pastern. Horses with erect pasterns are very prone to knuckle as they grow older, especially with the hind legs. All kinds of heavy work, and especially hilly localities are apt to excite the same thing. Knuckling may be produced by disease of the suspensory ligaments or of the flexor tendons, whereby they are shortened, and by disease of the fetlock joints.

Shoeing should be done with the idea of relieving the tendons and ligaments. Prepare the feet for the shoe by shortening the toe as much as possible, leaving the heels high, or the feet may be prepared as usual, but the shoe made very thin in front with thick heels or high calks. For the hind feet a long-heeled shoe with calks is recommended. In aggravated cases of knuckling it often happens that relief cannot be secured by shoeing, when the animal becomes useless unless surgical operation is resorted to.

Trip Hammer.—I saw an inquiry in a recent issue as to what kind of hammer would be advisable to instal in a shop. I put in the Easy trip hammer made by Mayer Bros., Mankato, Minn. It weighs 1,000 pounds and strikes 350 times per minute. You can hit very hard or slow and easy, as it is controlled with the foot and easy to handle, and most any kind of work can be done. I have short punches and narrow cut-off chisels and can cut or punch anything I put in. I also put in a gas engine manufactured by the F. M. Watkins Mfg. Company, of Cincinnati, O. a two-horsepower one. It is certainly a fine piece of machinery and starts with all ease, never failing to start at first attempt. Any boy could run it. I drive a fan for two fires and could blow four more; run one press drill, emery wheel, band saw, ventilation fan, and trip hammer and can run them all at once. If you need power you cannot do better than buying one mentioned above, as also a trip hammer made by Mayer Bros. My engine runs for less than ten cents per ten hours on natural gas, 20 cents per 1000. I always have power to spare. The two engines which I had before did not give satisfaction and I would warn the smith who buys an engine to get one well made and to start easily, and the Watkins will do this. The other engines which I had were very hard to get started, taking sometimes as long as thirty minutes. The trip hammer is very easily handled and saves a great deal of hard work. I also use the heavy steel forges with Champion No. 400 Blower. I can blow by hand or power, but do very little by hand. A. M. SPEER.

Tire Setting—In reply to John G. with regard to tire setting, I would like to say I have always had very good success with setting tires, old or new.

First, before removing the tire, mark both tire and rim at one joint on the back of the wheel. Take the tire off and if the wheel is rim bound, run a saw through the joint opposite your mark. If the spokes are loose in the rim, commence at the marked joint and wedge up each spoke (for buggy wheels I use the points of nails), and if the rim is crowded together saw out some more as at first. When you have your rim up all around, if your wheel has dish enough take out a very thin saw kerf, or if you want more dish take out more, but not over one-eighth inch. After measuring the wheel, run the tire before heating to see how much to shrink. Heat the tire on just one side of the joint opposite your mark and upset. True your tire up, cool it off, then run it. If you have to shrink it more, do so on the other side of the joint, and you will have very little trouble about your bolts going back. Give it just about one-sixteenth inch draw after the joint is closed and you will have a good job. On wagon tires it is not necessary to be as careful as with buggy wheels for they will not dish as easily as the lighter wheels. I think if John G. follows these instructions carefully, and does not make any mistake in measuring his wheel and tire, that he will have success. J V. RANDALL.

An Interesting Letter.—I wish to express my approval of THE AMERICAN BLACKSMITH, which I have taken since its first number. I think that reading a good trade paper is one of the essential points in keeping up with the times. I am running a general blacksmithing business in a small Nebraska country town. I have a very good outfit for a small place,—Weber 2½ horsepower engine, Mayers Bros. Little Giant Trip Hammer, emery wheel, disc sharpener, feed grinder and drill press, run by power. One of the most convenient tools which I have is a Winner back-geared lever shear. This is in use every day and will cut anything from a shingle nail to a buggy axle and I would miss it about as much as my anvil. In buying a shear, don't get one with the blades inside of the frame. The following is a list of our prices on some common jobs.:

New plow lays, solid cast, 14-inch....	$3.00
New plow lays, solid cast, 16-inch....	3.50
New lister lays, solid cast, 14-inch....	3.00
Sharpening plow lays..............	.25
Sharpening lister lays..............	.35
Sharpening cultivator shovels, four to set..............................	.50
Laying cultivator shovels, four to set	1.50
Shoeing, per shoe, new..............	.50
Shoeing, per shoe, old..............	.25
Welding mower sickle..............	.50
Buggy axles, short arm, one-inch....	6.00
Setting wagon tires, 1½-inch tread, per set..............................	2.00
Setting buggy tires, per set..........	2.00
Sawed wagon felloes, per piece.......	.25
Spokes, 2 inches and 2¼ inches, each..	.20
Wagon tongues....................	2.50
Bolsters..........................	2.00
Axles.............................	3.00

FRED H. WOOD.

On Axle Hints, Criticisms.—If C. D. Bridell wants to "turn work off faster," why does he waste time by taking two heats to weld an axle? One heat is all that is necessary on a steel or iron axle of carriage size. Lay the ends together, as at A, for a good weld. If afraid they will slip, scarf like B, when they will fit tight and "never slip."

In connection with the foregoing, wish to say that every experienced smith taking this journal should not let anything go uncriticised unless it be of the very best. I wish to differ with my brother craftsman who says that half of the spokes in a buggy wheel may be turned in order to take out the dish. What will the work look like? I also would like the other smith, who bevels his felloes 1/16 of an inch to keep the dish in the wheel, explain how he fits a tire to such a bevel and how he keeps it on after he fits it, as this is certainly puzzling to me.

Another smith says he stretches a heavy tire which is too tight by fullering it on the edge. I also disagree with this craftsman, and would like to know if any other mechanic of our trade does this? R. O'HEARN.

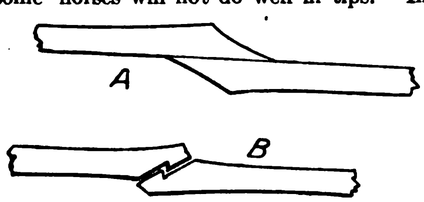
Welding Compound and Crucibles.—The following description of a home-made crucible and tongs to handle the same may be of interest. A band 3 or 4 inches wide by ⅜ or ½ inch thick is rolled up into a round or cylindrical form, about 3 inches in diameter, and then lap welded. Next make a plate or disc of the same diameter, which is welded on the bottom by fusing the rim from one point all around. The tongs are made with long jaws pointing down at right angles with the handles, instead of in line with them. The jaw going inside the crucible is round and the other one square. They are also a useful tongs for welding bands and singletree clips, etc. This crucible is one of the most useful things in my shop for making babbitt or solder, brass, or in fact you can melt any metal in it with care. The tongs are cool when you lift the crucible out of the fire to run. They cannot be detached until ready to run; then they are cold and grip well.

A very good flux for steel welding is made of borax, by first melting it in a crucible like the above. It is well to melt it until it looks like dark syrup in the bottom of the crucible. Then run it out on a dry, clean floor to cool. When cool, powder and mix with filings or fine borings of wrought iron or steel. Put this on the work when well red and your judgment will determine its value. The steel must be on the verge of a good fuse when this is applied. I have the best results from it. It is very convenient and cheap flux; therefore, I would recommend it to the craft for a trial. J. P. MULRONY.

Remarks From Down East.—I have read with interest a good many articles on horseshoeing, interfering, etc., in THE AMERICAN BLACKSMITH. Regarding scientific horseshoeing, there is no such thing. But practical horseshoing is all right. As there are no two horses gaited alike, neither are there any two horses that need to be shod alike. Therefore science doesn't apply to it, but practice does.

About two thirds of the shoers in the world shoe too heavy at the heel and too high. That is, they take a shoe that's one or two sizes too large for the foot and turn down a great big heel calk and too high, thus raising the frog of the foot an inch or more from the ground and bringing the nail holes too far back in the heel, which will ruin the best foot on earth.

Far better take a shoe a shade small for the foot and draw the heels out and turn down a small low calk, which will leave the nail holes nearer the toe and allow the frog to come nearer the ground. This applies to sound feet. But for contracted feet and corns, which two evils go together, the best remedy is to shoe with tips. But to shoe with tips, the smith has to use a lot of judgment mixed with a lot of experience, as some horses will not do well in tips. In such cases use a shoe with no heel calk and as thin a heel as possible. In some cases bar shoes are necessary for corns. But tips are always best for contraction where there are no corns. A. D. MCLANE.



SCARFING AXLES FOR WELDING.

Diuresis.—A work horse of mine recently died, after ten days' sickness. He would hold his head down, his ears were cold, but he ate well all the time. He drank lots of water and would urinate every little while. He seemed weak in the hind legs and would stagger when he walked.

In Reply, the disease "Diuresis" consists in an excessive secretion of a clear watery urine with a correspondingly ardent thirst, rapidly advancing emaciation, and great loss of strength and spirit.

Its cause may be the reckless administration of quack horse powders, acrid plants in grass or hay, new oats imperfectly cured, an excess of oats or other very watery food, a full allowance of salt to animals extremely fond of it, or most commonly, grain, hay or bran which has not been properly dried, and which has become musty and permeated by fungi. Thus, hay, straw or oats secured in wet seasons and heating in the rick or stack is especially injurious. This malady is widespread in wet seasons, especially in rainy districts.

As for symptoms, the horse drinks at every opportunity and passes urine on every occasion when stopped, the discharge being pale, watery and inodorous. The flanks become tucked up, the fat disappears, the bones and muscles stand out prominently, the skin becomes tense and hide bound, and the hair erect, scurfy and deficient in lustre. The eye becomes dull and sunken, the spirit are depressed, the animal is weak and sluggish, sweats on the slightest exertion, and can endure little. The subject may survive for months or may die early of exhaustion.

The treatment consists in stopping the eating of the faulty drugs, poisons or food, and supplying sound hay and grain free from all taint of heating or moistness. A liberal supply of boiled flaxseed in the drinking water at once serves to eliminate the poison and to protect the irritated kidneys. Tonics like sulphate or phosphate of iron (2 drams morning and evening) and powdered gentian or Peruvian bark (4 drams), greatly help by bracing the system and hastening repair. To these may be added agents for destroying the fungus and doing away with its poisonous products. In the case of musty food, nothing acts better than large doses of iodide of potassium (2 drams), while in other cases creosote, carbolic acid (1 dram), or oil of turpentine, (4 drams), *properly diluted*, may be resorted to.

Gather or no Gather.—Mr. Nels Peterson has been entertaining us as visitors to his plant in such a way that we must feel very much obliged to him for the lesson we got. That they do not set axles with gather in that plant is none of our business, but his loyalty thus to his company in defending this negligence is another thing. I for one will disagree with him. In his last attempt to prove his idea correct, he turns his work upside down and sees it work to his satisfaction. He sets the axle to give bottom side of spindle a slanting position to a line drawn through centre of spoke and says, "It is this slant, together with the pressure of the load from above, that crowds the wheel to the collar." And if he had stopped here, he would not have been contradicted, but he goes on and says, "and renders gather unnecessary." A good way to settle an argument, is it not? An axle can be given pitch or gather enough to get the wheel up to the collar, but that is not the contention; it is to get it to run up to the collar with least possible draft, *i. e.* to avoid friction as far as possible. Everybody knows if a ring is started in motion over a smooth surface, it will move in a straight line as long as it stands straight up, but as soon as it begins to lean towards one side it will deflect from the straight line and travel in a curved line; the more it inclines the shorter this curve of line. For an example, take a wheel-barrow and you will see that you can make graceful turns simply by raising or lowering one of the handles. Another experiment: Move one bearing on the wheel-barrow slightly backward and you cannot push it in a straight line without holding one handle higher than the other.

Come back to the buggy. The axle is set for pitch, no gather. The wheels are inclined to the outside. With the buggy in motion, the wheels, if they could, would travel in a curved line, but they are kept in place by "slant of spindle and load above." This tendency of the wheels to run away from buggy, but held in check by spindle, causes the tires to creep or slip inwards as the wheels roll on. This creeping produces friction. (In Mr. Peterson's experiment with wheels bottom-side up, this friction was not produced, because it requires two surfaces to come in contact before there can be

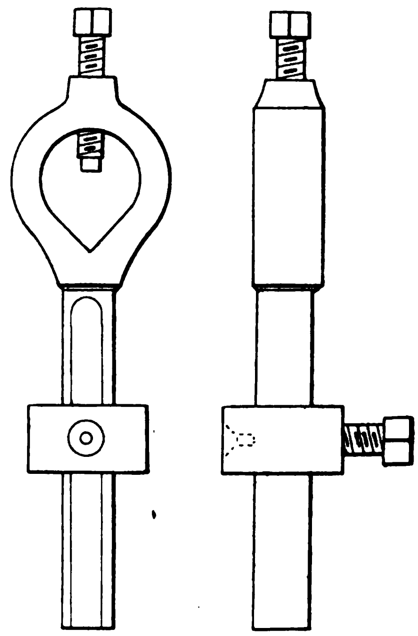
any friction). To overcome friction so produced, the thing to do is to turn the direction of the wheels inwards in front just enough to counteract their tendency to run to the outside. If we go too far, the creeping will be the other way. Yes, we can set gather enough to "*render pitch unnecessary.*" The way to get light draft renders both necessary, and by adding the two together it requires less draft than setting only for pitch. If more explanation is necessary I will come again. C. YOUNGSTROM.

Disease of the Eye.—I have a horse from whose eyes has been running for the last two months a water which seems to take off the hair below his eyes. By standing in the stable for a week or more at a time the eyes will nearly cease to run; then if I take him out and drive him the eyes will run again. The horse seems to eat good and feel good in other respects and his eyes seem to be no worse than they were a month ago. My stable is a good box-stall with one window in it at the south. I have tried different remedies recommended to me, which seem to do no good. What would you recommend me to do for the horse?

LYMAN F. TERWILLIGER.

In Reply to the question above, as nearly as can be judged from the facts stated, the trouble seems to lie in an inflammation, more or less severe, of the eyelids. This may be due to a number of varying causes, such as exposure to drafts of cold air, of cold rain or wind storms, to bites, stings or bruises, or in many instances it is the accompanying effect with other diseases. Inasmuch as the horse here described seems to be in good condition and also is improved by remaining in the stable, it is very probably due to the first-named cause, exposure to cold air, rain or snow. In cases of such inflammation the lids are swollen and thickened, more or less, and the inner lining of the lids is a deep red color. The part is hot and painful and a profuse flow of tears and mucous escapes on the side of the face, causing loss of hair. The treatment consists in applying a soothing lotion as the following: Thirty grains of sugar of lead, two teaspoonfuls of laudanum, and one pint of rain water boiled and cooled. It should be applied with a soft cloth kept wet with the lotion and hung over the eye by tying it to the headstall of the bridle on the two sides. If the mucous membrane under the lids shows small red granular elevations, a drop of a solution of two grains of nitrate of silver in an ounce of distilled water should be applied with the soft end of a clean feather on the inside of the lid twice a day. To aid recovery, the patient must have all aggravating causes removed and should be fed from a manger high enough to favor the return of blood from the head. Hard work and a tight collar should be abstained from. His diet should be laxative and non-stimulating (grass, bran mashes, carrots, turnips, beets, potatoes or steamed hay.) If improvement follows, the discharge becomes more tenacious and tends to cause adhesion to the edges of the lids. This gradually decreases in amount and the redness and congested appearance of the eye disappears, but the swelling, thickening and stiffness of the lids may continue for a length of time.

Holding Crank Shafts.—A few months ago there was an inquiry in THE AMERICAN BLACKSMITH for a way to hold crank shafts in turning. For turning light ones that are used for threshing machines, hay loaders, or any light ones, an adjustable dog made with a sliding collar, as is in the figure, is a good way for repair shops, as they can be instantly adjusted to the different throws of the cranks to be turned. They are much better than to spoil the looks of a dog by drilling centers along the shank and running the risk of spoiling a dog before you get th exact center. A good way to make the dog is to take a piece of 1$\frac{1}{8}$ or 1$\frac{1}{4}$-inch machinery steel; or an old axle stub makes a good one. Begin about 1$\frac{1}{2}$ inches from the end and split for about 2$\frac{1}{4}$ inches. Open the split and make it round on the end that the set screw goes in. Leave it V-shaped like a common dog on the shank end. This end should be from 6 to 8 inches long. Now center the piece and turn the set screw end, leaving the shank as large as the stock will allow. File or plane a flat place on shank for the collar set screw to work on, which keeps the collar from turning. This flat place should be on a line with the hole in the dog. The collar should be made of steel, nicely turned. Put set screw in one side of collar and directly opposite put the center hole for the lathe center to work in. For heavier crank shafts, it is better to make arms or castings bored and fitted to the ends of crank shafts. Sometimes it is all right to



SPECIAL DOG FOR TURNING CRANKS.

fasten one end of shaft direct to face plate at the right distance from center of spindle to give the crank the right throw. Turning solid crank pins is at all times a difficult operation on account of the distance the tool has to extend out from the tool post unsupported. BACKWOODS MACHINIST.

The Value of Wheels—In reply to "No Nothing" in the February number as to the comparative value of wood and Sarven hubs for wheels, will say that the value of a wheel depends on where it is to be used. If a wheel is desired for use mostly on a paved street and solid stone roads, the wood hub is much better and will last much longer, but if on the other hand you want a wheel for a dirt road then the Sarven wheel will give better satisfaction. At least this has been my experience in twenty-five years running a general jobbing shop for both city and country trade. G. W. HOPKINS.

Engine and Pulley Speeds.—Having been a constant reader of THE AMERICAN BLACKSMITH almost from the beginning, and having noticed a number of questions in regard to machinery in general, I think a few hints in regard to calculating speeds, size of pulleys, etc., might be of value to some smiths and carriage makers who are about to install power and machinery in their shops.

The principal change that has taken place in the shop of a progressive blacksmith in the past three or four years has been in the installation of an engine and purchasing of machinery in order to relieve the smith of much hard labor and at the same time increase his business. When the blacksmith wishes to put in an engine the question might be asked, what size of engine should he buy? Here is where most blacksmith's make a mistake in buying an engine too small, because then it will not give satisfaction and probably cause much trouble. Experience teaches that for work requiring two horse-power you should buy an engine of about four horse-power, because then there will be less danger of overloading and it will run smoothly all day, with very little attention, while the small engine must be constantly watched and a little carelessness will cause the engine to pound at the bearings, giving much trouble and soon being ruined. Another advantage of the 4-horse power engine is that it will allow you to put on other machinery later on and as a general rule more machinery is needed.

In choosing the speed of the line-shaft it is usually best to run it at a speed of about 200 to 250 revolutions per minute, because if run at too high a speed it generally causes a noisy running shop and the bearings must be more carefully watched to prevent heating. If there is much high speed machinery to be driven from the line-shaft it would probably be better to run it at about 300 r. p. m. If run slower, it will mean too large driving pulleys on the line-shaft.

In getting the size of pulley for the line-shaft remember that the diameter of the driving pulley multiplied by its number of revolutions per minute is always equal to the product of the r. p. m. of the driven pulley and its diameter. Suppose the diameter of the engine pulley to be 12 inches and the speed 300 r. p. m. The product then would be $12\times300=3,600$. If the line-shaft is to be run at 200 r. p. m. the product of its speed and the diameter of the pulley on it, which help to the engine pulley must equal 3,600, or the diameter of the pulley, would be $3,600\div200=18$ inches. The size of pulley on the line-shaft for driving other machinery is found in the same way. That is, we know the size and speed of the pulley on the machine, and we know the speed of the line-shaft, so from them as above we can figure out the size of the pulley we must put on the line-shaft to drive the machine at the required speed.

In finding the size of belt required the main element to be considered is the linear speed of the belt in feet per minute. Suppose the engine to be four horse-power. Then in order to find the size of belt, we calculate the speed of the belt, which would be one foot$\times3\frac{1}{7}\times300=$about 940 feet per minute (using same dimensions of pulley and speed as in previous calculations.) Now a belt having a speed of 800 ft. per minute is considered capable of transmitting one horse-power for every inch in width without undue strain on the belt. In order to transmit 4 h. p. with a speed of 940 feet per minute the width would be equal to $800\times4\div940=3.4$ or a 3$\frac{1}{2}$ inch belt would be required.

The speed of emery wheels should be such as to give a velocity to the circumference of about 5,000 feet per minute. Suppose we have a wheel 12 inches in diameter; its circumference would measure 12 x 3 1-7 or 37 5-7 inches and in order to have a linear velocity of 5,000 feet per minute the speed in r. p. m. would be equal to $\frac{5000\times12}{37\frac{5}{7}}=$ 1,590.

In general, emery wheels are not run as fast as they should be to get the best results from them. H. FELDHUS, JR.

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Shop Photographs Wanted.

Don't forget to send in a photograph of your shop for reproduction in THE AMERICAN BLACKSMITH. Interior views are the most interesting, if good, clear ones can be obtained showing the shop arrangement. With the photograph send also a few words about the tools, the amount and kind of work done, any item, in fact, that would make the description of greater interest to brother smiths.

Subscription Contest Announcement.

Last month was published the result of our winter subscription prize contest. We now announce another chance, open to any and all of our readers, to try for three prizes for the greatest number of new subscribers sent in between this time and September 1, 1904. The prizes are in cash, $5, $10 and $15, and in case of a tie for any of the three prizes, an equal division of it will be made.

In addition to the prizes, we offer a liberal cash commission, so that everyone who secures one or more new subscribers for us will receive something in return for the effort, whether he wins a prize or not. Drop us a line and we will give full particulars. This prize contest presents a splendid opportunity for making the spare summer minutes yield a good profit. We help all contestants to the utmost in getting subscribers, though relatively small clubs will probably secure the prizes.

Advertising Opportunities for Smiths.

Attention is called to the announcement on page XIV, giving a special schedule of rates for small advertising spaces. Readers who desire to put before their fellow-craftsmen any tool of their make or invention will be interested in this opportunity for doing widespread advertising at little or no cost. Some of the largest manufacturing plants of this country have been built up from the humblest of beginnings, and it goes without saying that in all such cases it was found as necessary to advertise as it was to have something to sell.

Our Blacksmiths' Directory.

Some time ago we asked subscribers to send in the names and addresses of blacksmiths in their locality, and the response was most hearty. We have decided to ask again, therefore, and this time are offering a neat souvenir in return. All that is necessary is to send 10 or more names of blacksmiths or wagon builders, carefully giving the addresses, and the little souvenir will be forwarded prepaid as a reward. Those who take advantage of this offer will kindly be careful to give the names and addresses correctly. This opportunity is open to any reader.

The Gas Engine Article Contest.

In this issue will be found some of the prize winning articles on the advantages of gas and gasoline engines in the smith shop. The contest was notable for the uniformly high standard of the articles submitted, making choice between them difficult. So much so was this the case that the judges after careful consideration decided to divide the cash prizes, amounting to $20, equally among the four following contestants: F. A. Wheeler, Lyndon, Kansas; William Murphy, Ida Grove, Iowa; Walter McCoy, Conway, Kansas; and Willet Creed, Newton, Illinois. Instead of three prizes of yearly subscriptions to THE AMERICAN BLACKSMITH, it was found necessary to award six, to the following contestants: B. T. McChesney, Brewster, Minnesota; W. M. Tanner, Du Quoin, Illinois; G. F. Sanders, Port Maitland, Nova Scotia; Wood Brothers, Carrollton, Ky.; T. P. McCanne, Newark, Texas, and W. B. Neethan, Bakewell, Derbyshire, England.

A great many other articles of high merit were sent in, and we regret that prizes could not be given at all. Among those deserving of special mention were contributions by J. Vestal, J. E. Shealy, M. J. Morford, F. L. White, J. S. Schafer, A. Bruton, S. J. Pemberton and R. A. Patterson.

These articles will be published from time to time in our columns as space permits, and are especially recommended to those readers who are thinking of putting in power. Any number of excellent points are brought out.

The Interesting Story of Thomas Newcomen, Blacksmith.*

DWIGHT GODDARD.

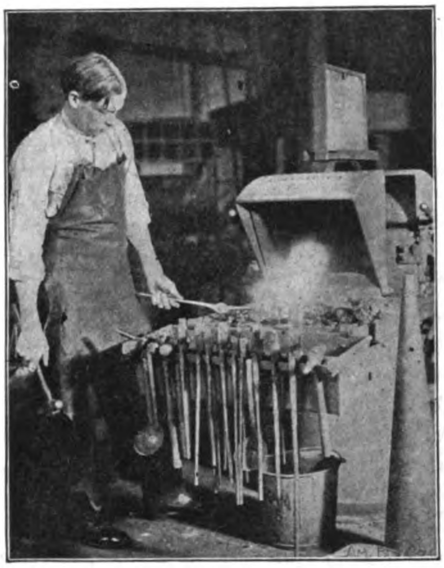
Concerning the personal history of this engineer very little is known, and yet the engine which bears his name was the very first use of steam in a successful steam-engine. It was so successful that it held the field almost without dispute for the half century preceding the epoch-making invention of James Watt.

There is no record of his birth, but the house in which he lived was standing, until comparatively recent years, on Lower Street, Dartmouth. It was apparently a house of the better class, and there are numerous indications of his respectable standing and connections. The parish church contains a group of memorials of his near relatives which all bear the mark of comparative wealth, but

*Published through the courtesy of Messrs. Wyman & Gordon, Worcester, Mass.

nothing remains to indicate the days of Thomas.

Newcomen was a blacksmith and ironmonger by trade, and as such had a high standing for excellent workmanship. It happened that Captain Savery, the inventor of the vacuum pump, lived



AT THE FORGE. THE RIGHT HEAT.

at Modbury, which was only fifteen miles distant. He made a great many experiments, and in one place it is recorded that he complained of the difficulty he had in getting machinist labor of sufficient skill to do his work. This gives color to one story of the beginning of Newcomen's interest in the use of steam, which is that Savery had him do more or less of his work. At any rate, the experiments of Captain Savery were common knowledge, and must have been known by such a skilled workman as we know Newcomen to have been, and who lived only fifteen miles distant. We also know that Newcomen had drawings of Savery's pump, and set one up in his garden with which to experiment; but Switzer, who was a friend of Savery, says that although Savery received in 1705 the first patent for the use of steam (it is interesting to know that this is also the first recorded patent of any kind), Newcomen was fully as early in his experimental work, and failed in securing priority because of Savery's more intimate relations with the Government. The Newcomen patent was granted in 1707 to three associates, Newcomen, Cawley and Savery. There is no doubt that Newcomen was the real inventor. Cawley was a glazier, who was his assistant, and Savery was included, it is generally accepted, because of his strenuous insistence that any use of the condensation of steam was an infringement of his 1705 patent. The true facts are that Newcomen's invention was radically different from that of Savery or any other single person. Papin invented the cylinder and piston as a means for transforming energy into motion. At first he used the explosive force of gunpowder, and later the use of the expansive force of steam, to raise the piston, and then by removing the fire to cause it to fall again. He made no further use of this principle. Savery discovered that the sudden condensation of steam made a vacuum that he utilized to draw up water. His pumps were actually used to drain mines, but were never satisfactory. They had to be placed within the mine to be drained, not over forty feet from the bottom, and then could be used to force up water an additional height of perhaps 100 feet. Beyond this the process must be repeated. It will be noticed that the water to be forced came into direct contact with the steam, which was contained in a solid vessel.

In addition tremendous pressures were necessary; as high as 1,200 pounds per square inch were secured, and with the materials for construction at hand frequent and disastrous explosions were the result.

Newcomen used Papin's cylinder and piston, and Savery's principle of the condensation of steam to produce a vacuum. But unlike Papin, he used the expansive force of steam to do his work and unlike Savery, he used a cylinder and piston actuated by alternate expansion and condensation of steam to transform heat into mechanical motion.

Thus it is seen that Newcomen, like a good engineer, constructed his machine from the suggestions of his predecessors. At first he made a double cylinder, using the space between for condensing water. This was not very satisfactory. The vacuum was secured very slowly and imperfectly. In 1711 they attempted to erect an engine for draining a mine, but failed. The next year they succeeded in erecting it, but it was slow and ineffective. To operate it, it required two men and a boy. The boy's work was to alternately open and close the valves to the condensing water and to the boiler. One day the engine made two or three motions quickly and powerfully. Newcomen immediately examined the cylinder and found a small hole, through which a small jet from the water that was on top of the piston to make it steam tight, was spurting into the cylinder. He appreciated the significance of the incident at once, dispensed with the outer water jacket and injected the water for condensation, through a small pipe in the bottom of the cylinder. It was a success at once and increased the speed of the engine from eight to fifteen strokes a minute

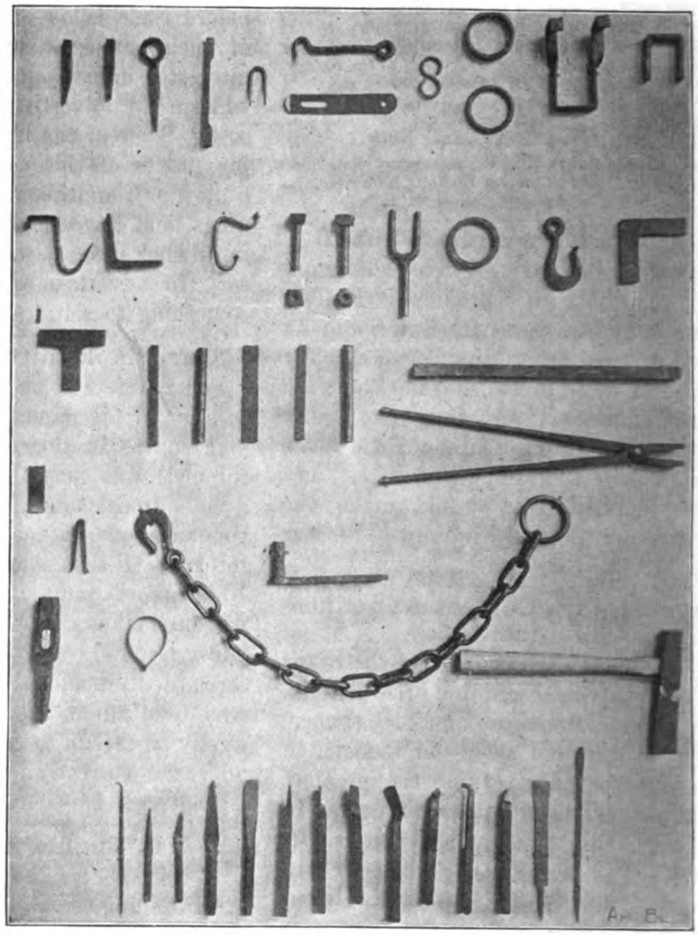


Fig. 1. ELEMENTARY WORK OF COURSE AT THE ROCHESTER MECHANICS' INSTITUTE.

besides getting the advantage of a good vacuum.

In 1713 a pump was erected in Leeds, and the boy who was hired to open and shut the valves, in an effort to make his

work easier, rigged up a contrivance of strings and levers that operated the valves from the motion of the working beam over head. This made the engine automatic and marked another stage in its evolution.

This boy, Humphrey Potter, afterwards became a good workman, and was sent to Hungary to erect the first engine set up there. This valve motion was afterward improved by Henry Beighton in 1718.

This engine, as it was now constructed and continued to be until the days of Watt, consisted of an underground furnace, over which was placed a semi-spherical boiler, the flat side of which had a deep spiral groove, along which the flame and heat passed to the chimney, in which at first was no damper even. Immediately above the furnace was the cylinder, braced in place by the timbers of the building. About twelve to thirty feet above was the cistern for condensing water, from which descended a pipe to the bottom of the cylinder. Another pipe carried the water of condensation to the hot well. Henry Beighton also used this water for boiler supply. High above was the huge wooden walking beam pivoted on the wall of the building. The piston was suspended from the beam by a chain that was kept central by winding on an arc on the end of the walking beam. From the beam also came the rod and pegs for operating the valves. From the other end of the walking beam outside the engine house, and directly over the pit mouth, was at first another chain, connecting to a single acting solid pump plunger. At first the boiler bottoms were made of copper and the tops of lead; later on sheet iron was used, but not until 1743 was cast iron used for this purpose. The steam space was eight or ten times the cylinder capacity. The third engine to be erected was at Ansthorp. It had a 23-inch cylinder, 15-inch stroke, 9-inch water plunger, and raised the water in two lifts of thirty-seven yards each. For this Newcomen was to receive $1,250 a year, for which he was to operate and keep it in repair.

In the years that followed, the size of these engines increased until Smeaton erected some with cylinders six feet in diameter. By the aid of these engines the mines could be sunk to twice the depth possible before, but the expense was very great, involving in one case $15,000 a year for coal for the engine.

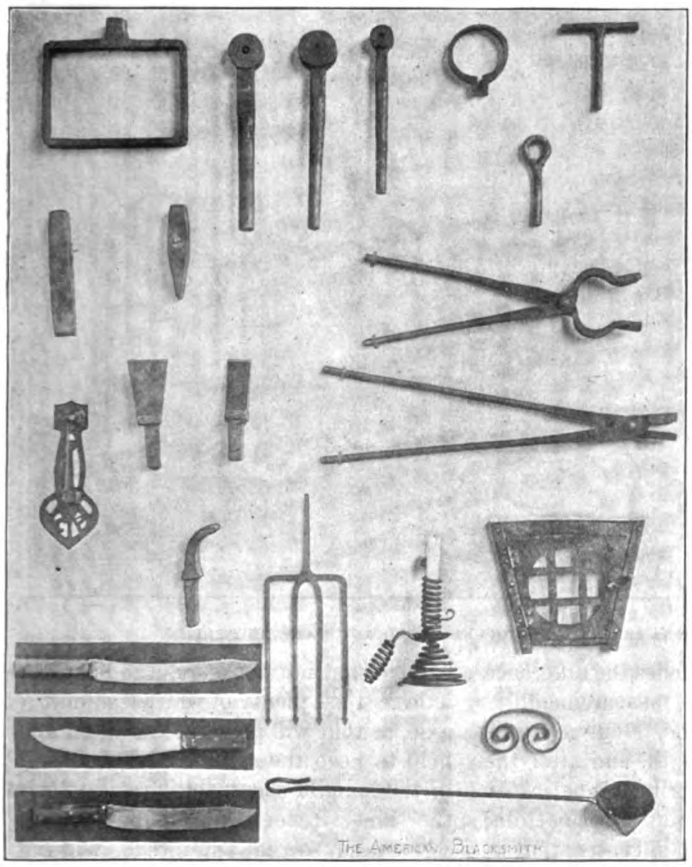


Fig. 2. ADVANCED WORK IN THE COURSE OF FORGING.

It was a model of one of these engines that came into the hands of James Watt for repairs that set his mind at work upon the problem, and resulted in the modern high pressure reciprocating engine.

Newcomen himself was a man of very great modesty and worth. He was very religious, and was accustomed to preach in Baptist chapels wherever Sunday found him.

No record of his death is known, but it is supposed that with the increase of the vexations of business competition, he retired northward to private life, and died about 1750.

His is the story of a man who was always alive to his opportunities, and who knew how to profit by them. It is unfortunate that his skill and labor did not secure him a greater reward, for his services were of no small benefit in early engineering.

The Summer Course in Forging at the Rochester Mechanics' Institute.

C. F. MOORE.

The Summer School of the Mechanics' Institute, Rochester, N. Y., will hold its first class in forging this summer.

A STRIKING PICTURE.

There has been a demand for such a school from several sources. It is to the Manual Training teachers, possibly, that the course will be best fitted. Nevertheless, it will be valuable to any one requiring a good general knowledge of forging, those who may wish to test their natural liking for the trade, or those who wish to enter technical schools with advanced standing on this subject. The course is similar to those offered in higher technical schools and will compare favorably with theirs.

As the regular school work here is along the lines of purely educational and industrial training (represented by the day and evening classes), the needs of both are known, and the course therefore so prepared as to meet them.

Fig. 1 represents the regular graded exercises which are taken up in succession by the students. Fig. 2 illustrates the work introduced at the end of the year, while Fig. 3 shows some of the ornamental iron work made by the pupils.

The equipment is among the best. The shop is well lighted, comfortable in summer, and has forges and tools for sixteen students. It may be unnecessary to describe such a course to the

readers of THE AMERICAN BLACKSMITH, as it will be similar to that outlined some time ago by Mr. John L. Bacon, of Chicago.

We first consider simple drawing out, bending and twisting of Swedish iron. Refined iron is then used and the comparison is readily made. More difficult forgings, such as sharp corners, irregular outlines, punching of holes, upsetting, etc., are then introduced. The metals used here are Swedish iron and machinery steel.

We shall spend about one-third of our total time on the various methods of welding. As each completed weld requires some considerable forging, we believe that this portion of our work is valuable training. It develops quickness and self-confidence. One of our best exercises is the making of a fagot weld. Two pupils are given pieces of scrap iron weighing about 10 pounds and are required to weld them into one solid piece. This may well illustrate the method employed by the blacksmith years ago when he required a piece of iron larger than any which he had on hand. Our work in welding includes Swedish and refined iron and machinery steel. An opportunity is available for testing welds upon a Riehlé 100,000 lb. testing machine.

The work in tool steel will be thorough and complete. The different kinds of steel will be used by the students or illustrated to them. The self-hardening and air-hardening steels will be shown, together with the method of forging them. The meaning of temper and temper number, and the ordering of steel will be explained. The various methods of tempering and annealing will be practiced.

Along with the work in the forge shop the student will be required to study the subject of metallurgy from a reputable text-book. We take this subject up in our regular secondary school work and believe that it is a valuable adjunct. Some may say that this is going too much into the technical side of the thing, but, since the use of iron is being spread out in every direction, from the erection of steamships and buildings, to the construction of highways, it is believed that every one should have some idea of its nature and manufacture.

Those who desire it, will be permitted to do special work in ornamental iron, brass or copper. It is hoped that many will take up the last two materials, as they offer an attractive field of work. Many boys leaving schools after passing the grammar grades, are perfectly familiar with the use of wood, but not of any of the metals. A small amount of this work could be introduced into such schools at a slight cost and great benefit. As affording something to be worked on at home, for the beautifying of the home, these metals can hardly be surpassed.

Rules for Making Wooden Axles.

M. A. FOSTER.

I will endeavor to give a brief explanation of how I make wooden axles, with simple rules which will apply only to narrow tread wagons of 4-foot 8-inch track. For 5 feet 2 inches the difference must be added to the measurements.

For a 9-inch spindle, I cut my axle 5 feet 2 inches in length, and after the axle is trued up, I strike a line in the center, lengthwise, top and bottom; also across the bottom in center; that is, half way from each end. These three lines are my gage lines to work from. I measure from the end of axle the length of spindle back towards the center, and mark a line around the axle at that point. For a straight wheel, I take off ½ inch from bottom of axle.

If the wheels are badly dished I don't take off any, but leave the axle perfectly straight. Then I get the size of my spindle inside at the small end, and set my compasses accordingly, and mark out the exact size of spindle inside by giving it $\frac{3}{16}$ inch gather, more or less, according to the wear of the spindles. If new, ⅛ inch is all right, but if badly worn, less is better. Great care should be exercised in fitting spindles. If properly fitted they won't drive more than ½ inch. Now, for a 9-inch spindle, I set it up until it will measure from shoulder at boxing 22½ inches to center of axle. The spindle should be slightly heated before driving, just enough to expand, but not hot enough to burn the axles. I use plenty of white lead on the axle, as that will preserve the wood and help to keep the spindle on. The hole in the spindle should be bored exactly the same size of the solid part of lag screw used, so that the threads will cut their own way as they go.

Now as to the way this axle is laid off: This rule will apply to all sizes except in length. For a 10-inch spindle the axletree is 5 feet 3 inches, and will measure when spindle is on from center of axle to shoulder of spindle 22 inches. For a 11-inch spindle, the axle is 5 feet 4 inches, and the measurement from

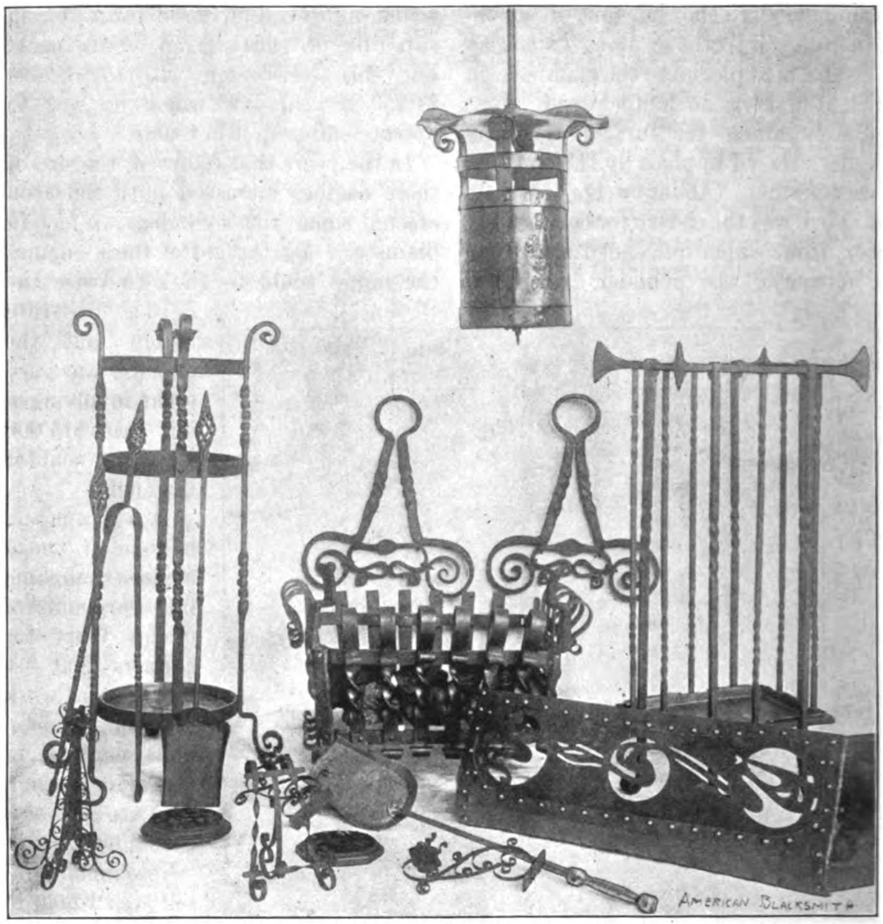


Fig. 8. ORNAMENTAL FORGINGS SELECTED AND MADE BY PUPILS.

center of axle to shoulder is 21½ inches. Larger and smaller spindles will be measured in proportion. I have used these rules for 20 years and never had any complaint, although on some parts it is necessary to vary a little, according to the conditions of wheels and spindles.

Talks to the Jobbing Shop Painter.—15.

Characteristics of Varnish.—The Spotting and Cracking of Varnish.—Their Causes and Cures.—Graining Out of Surfaces.—Remedy Suggested. —Practical Observations Upon the Use of Varnish, etc., etc.

M. C. HILLICK.

During the spring and early summer months the jobbing shop painter meets with many and varied difficulties in handling and getting his varnish supply into service. The average country paint shop, with a varnish room more or less unadapted to strictly high class results, and located in districts where pavements and water hose connections are unknown, handicaps the finisher to an extent not easily understood by those outside of the trade.

In the spring and early summer the painter doing business in the country or village shop must guard continually against getting his varnish into service before it is sufficiently hard to withstand the effects of mud and other injurious substances common to rural highways. The varnish upon a surface when dry enough to use in city service would in most cases be insufficiently hard to use over country roads. Moreover, in the city the vehicle user, or his servant, is more particular in the matter of washing his carriage immediately after a drive that "muddies" the varnish than his friend of the country who does not understand, or perhaps does not care, that mud or dirty accumulations are highly injurious to varnish if permitted to dry upon the surface. Against this class of service the painter must enlist his best energies, conducting a campaign of education until his customers become schooled in the art of caring for the newly finished carriage in a proper way.

Perhaps some proprietors of country shops meet with difficulty in using high grade varnish upon their work. Such an one lately wrote THE AMERICAN BLACKSMITH that he recently tried to successfully finish a certain job with an English varnish of world-wide repute, but failed. Undoubtedly, local causes and conditions, and not the varnish, were the chief reasons for the failure. It is well understood, or should be, that the higher the grade of varnish, the more delicate and sensitive its nature, and, if you please, its temperament; necessitating, among other things, a practically perfect surface for its reception and its subsequent support. Most English varnishes of high grade are light in body and for the display of their chiefest charms require a surface of surpassing smoothness and depth of body. And such surface conditions are not always to be had in the small shops, and for the money which carriage owners outside of the large towns and cities are willing to pay for painting, These exceedingly fine and delicately adjusted varnishes need great care for a long time after going into service. frequent washings and housing in apartments well ventilated and absolutely free from atmospheric impurities being urgently necessary. And what is true of the highest grade English varnish is likewise true of the same grade made in this country. For a strictly fine, high class surface, upon which unlimited skill has been expended, and which is guaranteed the care necessarily a factor in the early life, at least, of such surfaces, the writer would advise the employment of the high grade American or English varnish, but for all other surfaces, and the conditions of service which usually obtain in American communities, high quality but less sensitive varnishes are recommended. This much in reference to a subject which several readers of THE BLACKSMITH have lately desired information upon, and which may prove of general interest.

Spotting of Varnish.

Some varnishes are much more sensitive to mud or other accumulations, and, therefore, spot more easily than others; and highly elastic finishing varnish with a large percentage of oil in its composition, spots more easily than other kinds. The spotting of varnish from mud accumulations gives the painter more trouble, as a rule, than all other forms of spotting. City mud, which is commonly charged with a high percentage of ammonia, and the mud of lime districts, constitute the most destructive road accumulations against which the painter is apparently expected to safeguard his varnish. The mud acts upon the varnish in this wise: When allowed to dry upon the freshly varnished surface the suction, or technically, the capillary attraction of the dry mud extracts the oil from the varnish, causing the dull, lifeless splotches to appear. In some cases, as chemical experiments have shown, the spotting is due to the actual saponification, by the alkaline mud, not only of the oil, but of the gum constituent of the varnish.

Spotting of this kind, as indeed, spotting from mud accumulations of the mildest sort, is rarely cured save by rubbing the varnish with water and pulverized pumice stone and then revarnishing. Especially is this true of the highly elastic finishing varnish. The quick, hard drying, and therefore more inelastic finishing varnish, is more susceptible to a cure by washing the surface with clean cold water before the accumulations become too hard, than the elastic one.

To reduce the trouble incident to mud spotting to the lowest possible limit, the carriage painter should study the practices and customs, so far as possible, of his constituents, and endeavor to anticipate the needs of each individual customer, and to meet those needs. It is quite as much the painter's duty to instruct the carriage owner in the proper way of caring for the paint and varnish applied to the carriage, as it is to know how to apply such materials. And it is generally easier to explain the details of caring for the newly varnished carriage than it is to defend his position, and the quality of his varnish, once the varnish goes wrong. While it is usually cheaper to revarnish the carriage free of cost than to lose a good customer, it is advisable to bear in mind that varnish and labor are the two most expensive commodities consumed in the business of painting and varnishing vehicles.

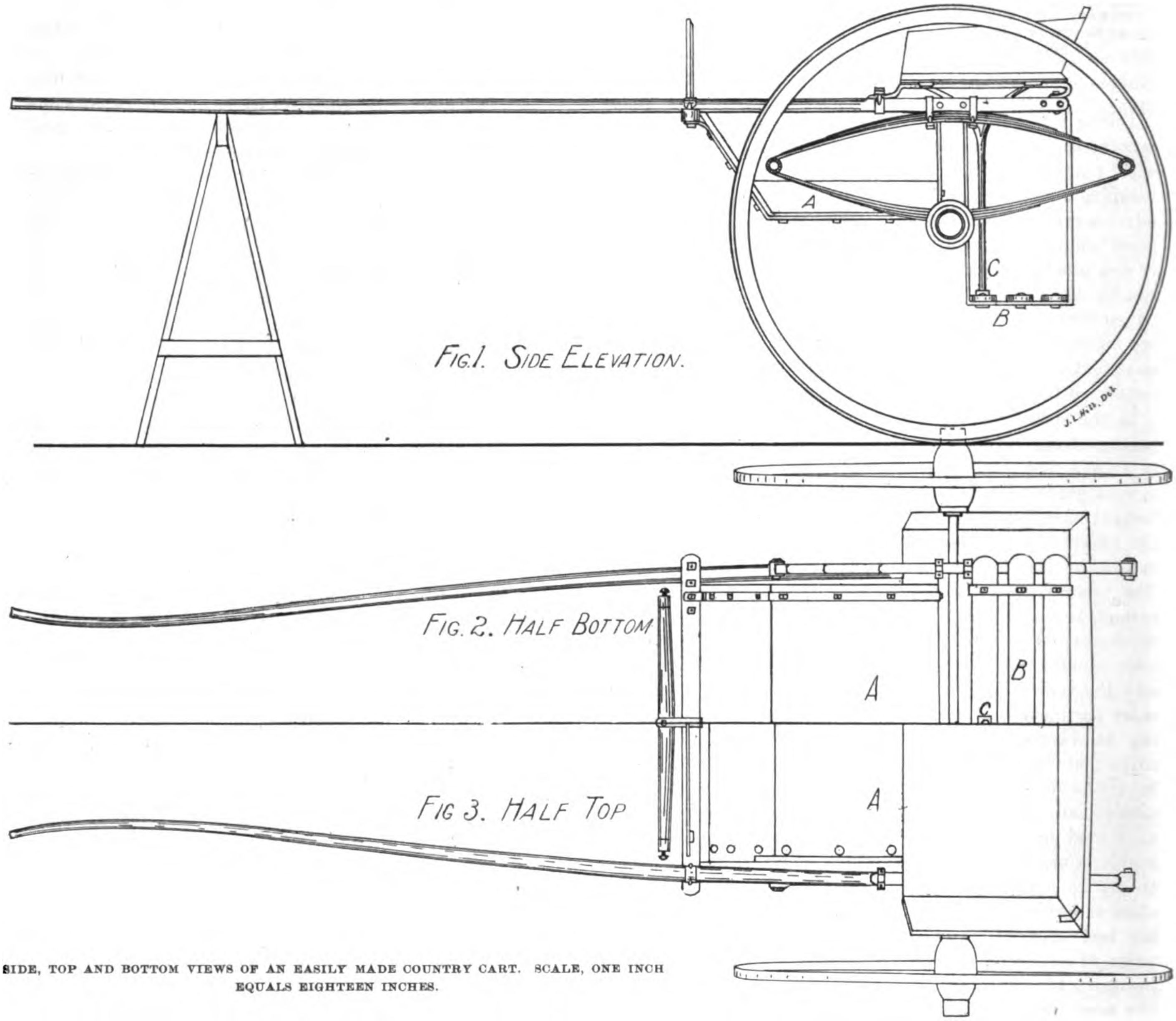
Upon the carriage that is to go into immediate general service, exposed to all the varied elements of wear and tear, and to road conditions as they are found regardless of the weather, it were better to use a high class, reliable, quick, hard-drying finishing varnish than the elastic one with a pedigree of four generations of international fame back of it. In other words, ascertain the conditions of service to which the vehicle is to be exposed, and use a varnish best adapted to stand up and hold its natural brilliancy against such service. Invariably this will prove the just and satisfactory way to all parties concerned.

Spotting due to soapy or dirty water which may or may not contain a percentage of alkali or acid, may generally be cured if washed with clean water before the spots have long remained upon the surface. Otherwise resurfacing and revarnishing will be necessary. Coal stove and smith forge gases

cause dull, greasy spots to appear upon the surface. If noted in time they may be eradicated by washing, and if not, revarnishing is the only cure. Some varnishes will spot distinctly under the effect of strong air currents, but as a rule this form of spotting yields readily to the water bath.

Cracking of Varnish.

In cracking and fissuring varnish simply responds to a natural law which provides that it is the ultimate destiny of varnish to become inert and break like glass. All the cracking which occurs prior to the time when the varnish has lost its elasticity, or in other words, worn itself out, is due to several causes. Briefly, these are: Applying one coat of paint upon another before the first one is thoroughly dry. Imperfectly dried rubbing coats, antagonism between varnish coats or between the color coats and the varnish. Exposure to ammonia—a fearfully destructive enemy to varnish,—moisture in the wood or in the foundation coats of paint. The long and usually circular cracks at the corner of the carriage seat, or across the seat raiser, or just over the step, on the panel, are force cracks, and in case of light, insufficiently stiffened panels, they are technically known as vibration cracks. Then there are the fine gossamer checks which appear often upon a rather newly finished surface, and called "fire checks." These, along with force and vibration checks, if taken in time, and before they have broken too deeply into the surface, may be obliterated by lightly rubbing the surface with pulverized pumice stone and water and revarnishing, applying one coat of rubbing varnish and one coat of finishing. When the cracks have gone too deep for effective eradication under fresh coatings of varnish, the only remaining remedy that will prove really effectual is to remove the offending varnish by scraping down to the color coats, or removing the varnish with some one of the varnish removers now on the market. If the cracking is due to some disturbing factor in the color or foundation coats, then burning off, or removal with a paint and varnish remover, is the only sure remedy.



SIDE, TOP AND BOTTOM VIEWS OF AN EASILY MADE COUNTRY CART. SCALE, ONE INCH EQUALS EIGHTEEN INCHES.

These two varnish difficulties considered with that of "graining out" which is due to unseasoned wood, and which revarnishing will materially assist to conceal, but not cure, constitute the chief difficulties which the jobbing shop painter is compelled to handle during the spring and early summer in connection with the use of varnish. Cracking and "graining out" are all the year round problems, but spotting, more bothersome than all the rest,

is a spring and autumn ailment of varnish. In a subsequent issue some of the mid-summer varnish deviltries will be taken up and remedies suggested.

(To be continued.)

Details for Building a Country Cart.

J. LAWRENCE HILL.

The accompanying drawings illustrate a very convenient two-wheeler for country use, suitable for carrying besides one or two passengers, a sack, or basket, or other medium sized package. Carts similar to this are used extensively in the West, they being found handy to get about in, also cheap, for any blacksmith can make them.

Fig. 1 shows the side elevation, Fig. 2 the half bottom, Fig. 3 the half top, and Fig. 4 the back view.

As will be seen by the various illustrations, ingress and egress is obtained at the back, and for this purpose the seat is divided in half, one half being fitted with hinges, so that by opening, it admits of an easy passage in or out; the other half is securely fastened to the shafts. Fig. 4 shows this clearly, and also the method for keeping the seats up in the center.

By referring to Figs. 2 and 3, it will be noticed there is very little compass to the shafts, so that if the builder wishes he can cut them out of a 1½-inch plank. To do this, lay out on the floor in chalk a straight line, which is to be the center line; mark off the length of shafts and distance of crossbar from the points; lay off on each side the half distance between springs on the axle, which will be the inside of the shafts, also the widths at bar and points, and then draw in the shafts. When shaped to suit, transfer to the plank and mark the width out, at the bar 2¼ inches; at spring, 1¼ inches; at tip, 1⅛ inches. Saw out and dress up. The tip is 1⅛ inches round, tapered back 26 inches, where it is 1⅜ inches, the taper continuing back to the bar.

A is a tray 19 by 33 inches on the bottom, and 4 inches deep. The sides, back and bottom are ⅜ inch deep, the toe board ⅞ inch; round this is bolted an iron strap 1¼ by ¼, which is bolted at the front end underneath the cross bar. The back end is twisted so as to run along the inside of the shaft through which it is bolted. This same method is employed for holding up the back step B, thus securely fastening the whole thing onto the top of the springs.

In the center of B is C (side view and shape of top end seen in Fig. 1.) This is to form a solid support for the seat in the center. By having a long thread and two nuts on the bottom end, the height of the seat in the center can be adjusted to suit that at the ends.

Two ordinary "T" hinges are used on the opening seat. The short end is riveted on to the seat raiser, while the long one is screwed and bolted underneath the seat; at the center end of the lifting-seat a plate is screwed, which has two studs rivéted into it. When the seat is closed, these studs enter holes drilled in another plate which is fastened under the stationary seat. The seat raiser above referred to is made from a bit of steel tire 1¼ by ¼, bent as shown in Fig. 1, and fastened to the top of shafts by a clip in front, and bolt behind.

Following are a few of the principal measurements: Wheels, Sarven, 50 inches; spokes, 1⅛ inches; tire, 1⅛ by $\frac{5}{16}$ inch, round edge steel; axle, 1⅛ inches, half patent; track, 4 feet 9 inches out to out. Springs, center to center of eyes, 40 inches; four plates, 1¼ inches wide, 10 inches opening inside, 34 inches apart on the axle. Top of seat board to bottom of tray, 16 inches. Extreme length of shafts, 10 feet 1 inch; from points to bar, 6 feet 6 inches. Painting: seat, tray, hangers, dash, axle and clips, black; wheels and shafts red, striped with one ⅛-inch line of black.

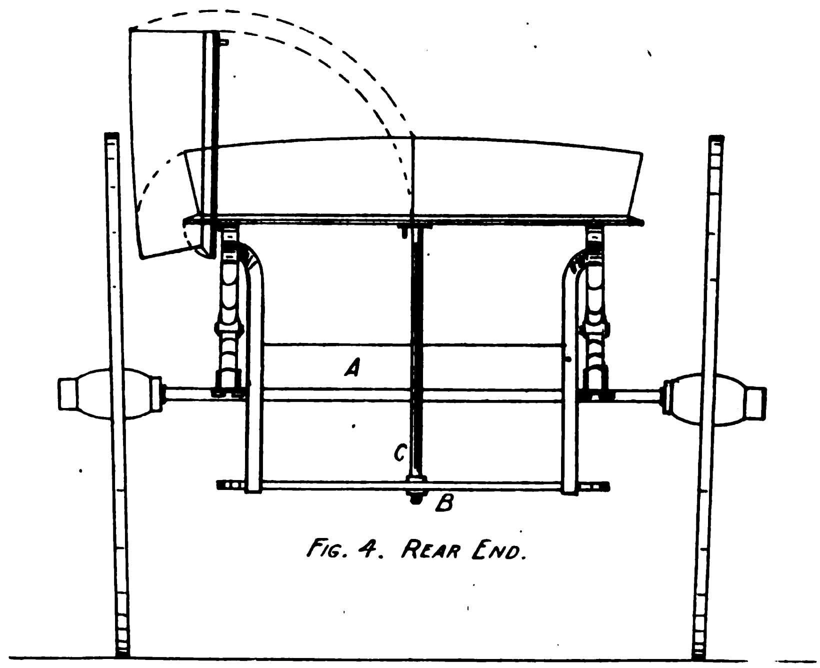


FIG. 4. REAR END.

REAR END ELEVATION OF COUNTRY CART. SCALE, 1 INCH EQUALS 18 INCHES.

Pointers on New Wagon Work.

Prize Article.

M. A. FOSTER.

Endeavoring to explain how I construct some wagon work, I will first take the wheel say for a 3¼-inch farm wagon. The hub must be perfectly dry, and 8½ by 10 inches This is for a new wheel. The spokes should be 2¼ inches, carefully selected and well seasoned. With a pair of calipers, I get the size of mortise next to the boxing, then the size at the surface of the hub, which is a little larger. I then get the depth of the mortise for the length of tenon. By this measurement, I cut a perfect pattern out of heavy paste-board. I lay this pattern on the spoke tenons and mark them all just the size of the pattern and carefully cut to the pattern. Next I place my bub on a bench suitable for driving the spokes. I set my gage for a straight wheel, use white lead on the tenons and drive with a wooden mallet. The spokes must fit the mortise exactly. If some are loose and others exceedingly tight, the job is worthless. After the spokes are all driven, get the length. Say your wheel is three feet eight inches in diameter. Take half of that, 22 inches, and 4¼ inches (half of the diameter of the hub) would leave 17¾ inches from surface of the hub to the end of the spoke. Gage all the spokes and saw them off 17¾ inches from the hub, and set your gauge back the depth of your rim, which is usually 2½ inches, marking each spoke as before. Pains should be taken to point them to the center of the spoke. Then you proceed with the hollow auger to cut the tenons, which for 1½ inch rims should not be larger than ⅞ inch. In boring tenons you should not bore straight with the spoke, but straight with the face of the wheel. Then the rim will go on level and stand

perpendicular. Hubs in the rim should be the same size as the tenons on the spokes so they will drive on tightly, and not have to be wedged, as that has a tendency to weaken the tenon. The rim should fit snugly against the shoulders of the spokes and be carefully jointed at the ends of the felloes. Leave ⅛ inch open at one joint for the draw. Dress the face side of the rim first. Then for a 1¼-inch tire, set your gage 1-16 inch smaller than the tire you use. True up rim for the tire and square the surface where the tire goes true with the face of the wheel and perfectly round. Now it is ready for a primer coat of paint before the tire is set. This is very important, for the paint has a tendency to keep out the water that a wheel gets in tire setting. If the tire is heavy, say ½ by 1½ inches, and is given the proper draw by the smith, the wheel will have ⅛ inch dish.

Now comes setting the boxing, which if done by hand, can only be properly done after the tire is on. Plug up the hole in the hub, get the size of your boxing, take the compass and center the hub, lay off the size of the boxing, fitting the small end perfectly tight, but a little larger for the large end, so as to give room to wedge and true up. Provide a gage that will fit in the hub and gauge your boxing with the edge of your tire, taking pains to get it perfectly true for on this depends much the running of the wagon. The boxing should be well wedged so no grease can get in the hub, for after a hub has become saturated with grease, it is useless, as the spokes will work loose and the grease also has a tendency to soften the hub.

Every part must fit perfectly before the tire is set. I have heard many remark that a tire would bring a certain piece all right, but the tire is not calculated to build a wheel. It is only to hold and support a wheel after it is built.

A Useful Method of Making a Socket Wrench.

L. VAN DOBIN.

The accompanying sketch is of a socket wrench we have used for many years. I made a set of six with which I can place or replace any size nut from ¼ inch to ⅝ inch inclusive, can do it ten times quicker and never skin a finger. The device is so simple I think any smith will readily comprehend it, and I know no smith will do without it after learning that it is so easily made.

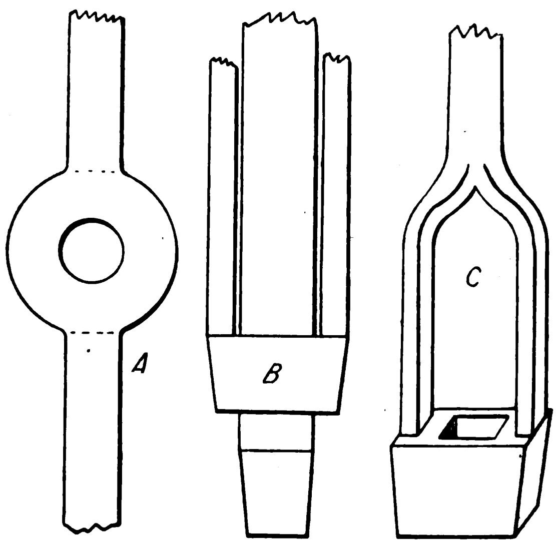


Fig. 1. FORGING A HANDY SOCKET WRENCH.

To make, use Norway iron or machine steel, size according to size of wrench to be made; for ¼ inch or $\frac{5}{16}$ inch wrench use about 1¼ x ¼, for larger about 1¼ or 1½ x $\frac{5}{16}$ inch. After shaping as at A, Fig. 1, bend shanks up at dotted lines, drive round mandrel in hole, and draw out socket while on mandrel, as shown at B. After this put in square mandrel and square up to proper size, then hang shanks between vise jaws and with light hammer true up end of socket. Insert square mandrel and finish socket. Bend ends of shanks together and weld, as at C, then from band iron ⅛ inch thick cut out piece like that at D, Fig. 2, place on top of socket between shanks, take light borax heat and stick it. Drill a hole, as shown at E, to accommodate the end of the bolt when putting on or taking off nut.

Weld on to round iron to form brace stock, and after putting knob or ball on the other end, bend to shape as is seen in Fig. 2, which shows the finished wrench. The size of round iron we use for brace stock is ½ inch for ¼ and $\frac{5}{16}$ inch wrenches; for larger use ⅝. Any smith can get the length near enough. Considering cost, this is the handiest tool in the shop. The writer can make a dozen a day, and the "monkey" or "S" wrench is a makeshift compared with it.

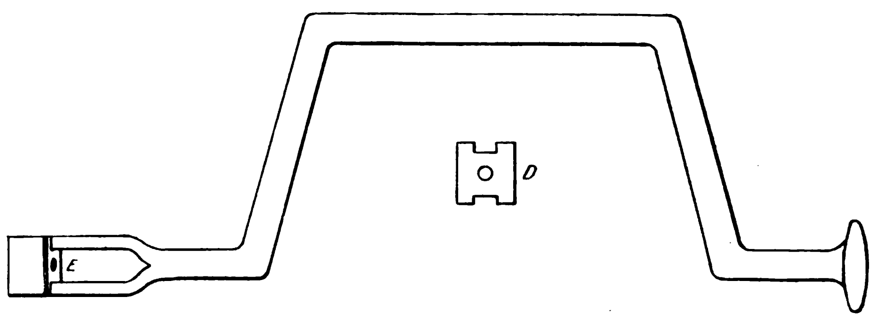


Fig. 2. THE COMPLETE WRENCH.

An Apprentice's Attributes.

BY H. W. T.

To make a good blacksmith an apprentice should be:

Active,
Bright,
Cheerful,
Diligent,
Energetic,
Frank,
Good tempered,
Honorable,
Independent,
Just,
Keen,
Laborious,
Manly,
Noble,
Obliging,
Persevering,
Quick,
Resourceful,
Sensible,
Truthful,
Unselfish,
Virtuous,
Wise,
'Xcelling,
Young.

A List of Prices From Missouri.

R. L. HOOPER.

Shoeing, toed, per horse		$ 1.20
Plain shoeing calks		1.00
Filling wagon wheels per set		12.00
Tiring buggy, 1 by ¼, per set		5.00
Wagon tires, 1½ by ½, iron, to ⅝	6.00 to	8.00
Plow Shares—		
12-inch		2.50
14-inch		2.75
16-inch	3.00 to	3.50
Farm wagon, double box	10.50 to	12.00
Tongues		1.50
Tongues, straight without hounds, complete		2.75
Wagon reaches	.75 to	1.00
Setting tires on farm wagon		1.50
Setting tires on farm wagon, bolted		1.70

Tire setting, buggy	2.00
Tire setting, spring wagon	2.25
Buggy shafts, per pair	4.50
Buggy tongues	2.00
Spring wagon tongues	2.50

The Making, Hardening and Tempering of Rock Drills.—2.

W. P. WOODSIDE.

On page 45 of the December issue I described the style of drill which I consider the best, and the reasons why it is the best. The next step is to make one and harden it properly.

It will be seen (Fig. 2), that the first

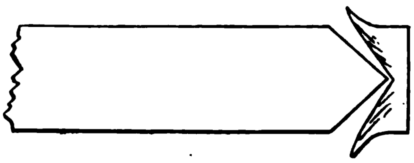


Fig. 2. MODE OF CUTTING DRILL BIT READY TO FORGE TO SHAPE.

operation is to cut the bit, which is done with a thin hot chise'. Next flatten the bit with a couple of heavy blows that will be sure to work the steel clear through (that is, the center of the bar should be moved as well as the outside). Next take the drill dressing hammer and shape up the bit and bring it to edge and gage. Fig. 3 shows styles of hammer used. I have used both styles and like them equally well, although A is a little handier, having the gage on the back, while B has the advantage of the bevel face, which helps to draw the drill to an edge very quickly and easily, though some smiths do not approve of it. I think the reason is

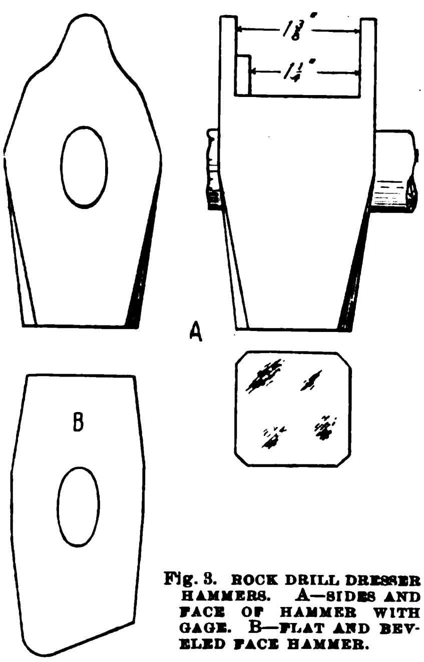


Fig. 3. ROCK DRILL DRESSER HAMMERS. A—SIDES AND FACE OF HAMMER WITH GAGE. B—FLAT AND BEVELED FACE HAMMER.

they did not use it long enough to get used to it, as it bothers one considerably at the start, but with a little practice one will find it quite easy to use. Hammer A is made of 1¾-inch square tool steel; B is made from 1½ or 1¾-inch square stock, and has the flat face on one end and the beveled face on the other. If the smith is at all handy, two heats are all he needs to cut the bit on a new drill and sharpen it ready to harden. In fact, I have often seen it done in one heat, but two heats is very good work. The size of steel I am referring to is one inch or 1⅛ inches, octagon drill steel for hand drilling, or, as called by some, "jumpers." Now, if we are not rushed the drill is laid down to cool, but if in a hurry like most drill dressers, we put it back in the fire and bring the heat to the hardening heat which I will not attempt to describe any more than a low red, or cherry red, as called by some, though this varies as does the color of cherries. When your drill bit comes to a nice, even, low red heat, plunge instantly into the hardening bath, which should not be ice cold, but about 60 or 65 degrees Fahrenheit, and composed of either salt and water, or clear water. I use mostly clear water for ordinary rock, but if the rock is very hard, such as one strikes in mines and rock cuts, I use about one bushel of salt to 30 or 35 gallons of water. If a brine tester is used it should show about 65 to 70. Be careful in putting the steel into the bath, and do not drop the steel to the bottom of the tub right away, as there is more or less dirt gathered in the bottom from off the drills. If the edge of the drill comes in contact with this before it has cooled enough to prevent softness, it will make the edge of the drill soft. That is the reason why I do not always use salt, as the water gets dirty so quickly that one has to be making new brine continually. If the smith is kept busy on drills every day the water should be changed at least every month, and better if every two weeks.

Prices on Blacksmithing at Perryville, Ark.

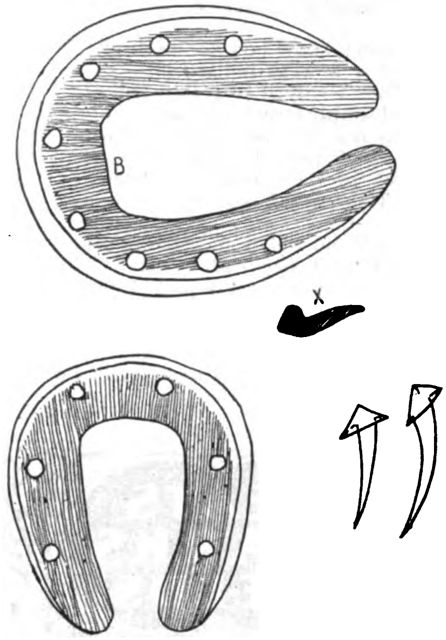
M. A. VANDALSUM.

Horse shoeing	$ 1.00 to $ 1.20
Wagon tongue	1.75
Wagon axles	2.50 to 3.00
Wagon bolsters	1.25
Wagon reach	.75
Double trees	.50 to 1.00
Single trees	.50 to .75
Sand board	1.00
Wagon hounds	.75
Filling wheel	3.50 to 5.00
Setting tire	.50 to 1.00
Buggy tire	.75
Setting buggy axle	1.00
New tires	2.00 and up.
Setting thimble and boxing	.50
Log chain hooks	.25
Sharpening plows	.10

Korean Horseshoes.

NEILS SANDELL.

The sketches herewith show what seem to me to be timely subjects, and I shall endeavor to describe them briefly. They represent shoes made at Chemulpo, Korea, hand forged and of seemingly



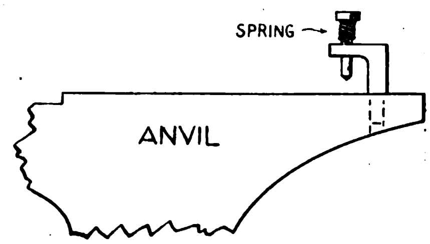
KOREAN HORSESHOES AND NAILS, HALF SIZE. X, CROSS SECTION OF SHOE AT B.

tough iron, resembling Swedish iron. The holes are round and cold punched. The two shoes together weigh 3½ ounces, and the sketches show them half size.

A Very Handy Center Punch.

M. A. SHARP.

To make a handy center punch for anvil, with a spring, take a piece of iron of suitable size, swage to fit anvil hardy hole. Then bend it two inches above at right angles and let it extend out two inches. Through this part drill a hole



A USEFUL ANVIL PUNCH.

and make a center punch with a hole through the body and a head, so that a coiled spring will hold the punch ⅝ inch from the anvil. I use this for punching tires and do not have to call help.

Dobbin's Despair.

I have no differential clutch
  And no pneumatic tire;
I guess I don't amount to much,
  For none come to admire
My form or speed—I have no cam;
  And, to my deep remorse,
I must confess I only am
  A one-horsepower horse!

They used to stroke my sorrel side
  And tell how I could go,
Today they speak in tones of pride
  Of some bright red tonneau.
But, though my sorrow is so great
  And anger is so keen,
I'm glad to have a chance to state
  I don't eat gasolene.

I don't know how to carburet,
  Nor how to radiate—
When I wished to get up and get
  I simply struck my gait.
'Tis true, in casting out the beam
  For fairness I should try—
But 'lectric, gasolene or steam,
  The "mote" is in my eye!

I have no wondrous steering gear—
  But still they rush to see
A thing that has, I'm pained to hear,
  A horseless pedigree.
They used to pet me all the time,
  But now they only shrug
Their shoulders, and pass by, for I'm
  A poor old sparkless plug!

—*Ex.*

HEATS SPARKS WELDS

Dry weather—loose tires.

Stand up for the good old craft.

An ounce of thrift is worth a pound of wit.

Be sure that the end of the spoke doesn't project after the felloe is driven.

Why must axles be given pitch and gather? Is the reason clear in your mind?

Quoth the farrier: "Money may make the mare go, but the mare makes the money come."

Have you a photo of the shop, inside or out? Send it in for publishing in our columns.

Don't forget to advertise your business,—all the time, too. There are many ways of doing it. Think them over.

There's many a slip—the man who is sure pay now many not always be so—and the big failures are the worst.

Seek the orders. He who waits for them to come often finds that the other fellow catches them before they get as far as his shop.

There's more than one way to go after the man who doesn't pay promptly. It's well to know them all, too. Collecting is an art in itself.

Summer moments here and there can be profitably employed in helping us swell our subscription list. See announcement on page 161.

What side line are you thinking about putting in this spring? There's generally something the smith can turn his hand to at odd times for increasing his income.

Here it is June, and our friend Tom Tardy hasn't yet taken down the stove that he tries to warm the shop with in winter. It is awfully in his way, and in his customers' way, too.

Count up the crafts in the whole page of the world's industry, and see how few are they that do not at one point or another depend upon the blacksmith's skill and strength.

Your favorite journal—don't forget to say a good word for it to brother craftsmen. Many smiths show their appreciation by sending in a new subscriber or so occasionally.

Lots and lots of AMERICAN BLACKSMITH readers are taking advantage of the long-time subscription rates for two or more years in advance. Seem to be getting more and more popular.

Here and there women are engaged more or less actively in blacksmithing and similar pursuits. THE AMERICAN BLACKSMITH would like to be informed of any such. Can some reader tell?

Make the jobber give you a discount for prompt pay, and then pay prompt. Saves a good big sum in a year. Works a benefit at the other end by making you look more carefully to your own collections.

A World's Fair feature of general interest is the Japanese exhibit of diminutive trees, only two or three feet high, although several hundred years old. This forest of little trees is a part of the attractive display of many interesting exhibits which Japan shows at the Fair.

How many smiths in your locality take no journal relating to the craft? Give them a friendly call, show them THE AMERICAN BLACKSMITH and get them to subscribe. You do us a service, them a service, and we give you a premium or cash commission. Write for particulars.

The telephone is an indispensable adjunct of up-to-date city shoeing shops. The country blacksmith finds it will also pay to be connected with a 'phone line, many of which are now being run in rural districts. It is a big convenience to the customer, as well as the smith, and stamps the smith as progressive.

Blind as a bat—that's the condition of some smiths who can't see anything for them in craft organizations. Doesn't take much studying to find out who is benefitted by price cutting. The liberal minded smith always looks into every movement for better craft conditions—generally he supports them heartily.

Drillers in a Texas oil well, when they reached a depth of 1,000 feet, encountered the trunk of a tree. Large pieces of bark and wood of clear grain have been brought to the surface in a perfect state of preservation. The wood is very hard and the tree measured, as near as could be estimated, between two and three feet in diameter.

A small boy in Wilkesbarre recently was curious to see what the jaws of a lazy-looking snapping turtle were like. The boy suddenly found his hand so cruelly held in the turtle's mouth that neither he nor men who came to aid him could get it out. A blacksmith came, armed with stout pincers and a big file, and after much effort managed to free the youngster's hand. This is a new line of work for blacksmiths.

Women blacksmiths—A blacksmith's shop managed entirely by three women is one of the interesting sights to be seen in Kansas. The mother took entire charge of the business about fourteen years ago upon the death of her husband and had her daughters brought up not only to shoe a horse, but to understand every branch of the trade as well. The mother died, and now the three daughters, one of whom is married, have five men in their employ and carry on a very prosperous business. They personally superintend the shoeing of every horse.

It goes without saying that net profits may be enlarged by increasing receipts or decreasing expenses. Greater receipts result from more business or better prices, though collections go hand in hand with both. The business blacksmith looks also on the expense side of his books, in his effort to make the shop yield greater net returns. He watches every opportunity for stopping wastes. He is a shrewd buyer, and does not tie himself up to any one house. He knows that competition is keen and takes just advantage of it. He knows that many firms will make low quotations at the start to secure his business, and hence frequently requests figures from different houses. He takes advantage of discounts for prompt pay—in many such ways he reduces expenses and increases profits.

A reindeer express—The capacity of the reindeer for team work is remarkable. His hoofs are very broad and do not penetrate the snow crusts. His average weight is about four hundreds pounds. He will swiftly draw a sled carrying six hundred pounds, and with this load can cover thirty, fifty, and even ninety miles a day. The reindeer teams now carry the mails a distance of six hundred and fifty miles on the most northerly post route in the world. No food is carried for the deer. At the end of his journey, or at any stopping place, he is turned loose and at once breaks through the snow to the white moss which serves as food. It costs nothing to feed him. As the white settlements increase in the mineral bearing parts of Alaska, and in many places remote from railway and steamboat transportation, the reindeer express will be one of the most important factors in far north territorial life.

Drilling is quite an art in itself from the standpoint of the inquiring machinist. Drill soft castings dry. In hardcast iron deep holes, put a drop or two of machine or lard oil on the body of the drill occasionally, but never any on the cutting edge. In wrought iron the best results are obtained by keeping the drill continually flooded with a sal soda solution, six quarts to half a barrel of soft water. Soft steel, machine steel and cold rolled steel, treat like wrought iron as to lubrication, but give a higher speed to the drill. Tool steel can be drilled using clear lard oil or the sal soda solution, but never machine oil. Grind the drill with less clearance back from the cutting edge. Drill tempered steel with a flat drill, tempered hard as possible, using a half and half mixture of chloroform and camphor on the cutting edges. Drill brass dry, with a straight fluted drill.—[Ex.]

American Association of Blacksmiths and Horseshoers.

Once more let us urge upon those who are thinking about starting a movement for better prices not to delay making the first move. Send for the plans which we have prepared to guide those who wish to take up the work and which we are glad to furnish without charge. Do not delay any longer, but begin at once, enlisting the aid of other progressive, energetic craftsmen to help out, if possible. Many letters come from various parts, with encouraging reports of good progress. It cannot be expected that a week's work or a month's work necessarily will mean raised prices all over a county. No movement of this kind was ever successful without overcoming some obstacles. The point is, there's everything to gain and nothing to lose by an effort to bring the smiths of any county together. Our experience is that some gain almost invariably follows, even if there are a few men who, refusing to look farther than their own noses, cannot recognize the many benefits of such a mutual organization for the co-operation of its members. The moral of it all is, take up the work; take it up now, take it up with enthusiasm and determination to make it go.

Regular meetings are being held at this time in Cortland, Cayuga and Tompkins counties, New York, for taking in new members. The time when they will be admitted upon the present advantageous basis will soon expire. The recently elected officers of the Cortland County Association are: J. McCloud, president; Walter Hodgson, vice-president; Charles W. Cropser, secretary, and W. Skhane, treasurer. Active work is now going on in Seneca County, New York, for the purpose of organizing the craft in that locality at an early date.

A Plea for Lien Laws and Organization.

W. B. NEWTON.

I am heartily in favor of the lien law. I have learned by experience that it is one thing for the blacksmith to earn his money, but often a more difficult job to collect it. Our farmers, merchants and various classes of business men must have a mortgage, security or similar means of making their earnings safe and secure on the material they sell. But the blacksmith can buy his own material, give his time, his talent, his physical strength, the use of his tools, and, above all, plenty of patience, and get—a promise of pay. This promise may be fulfilled in a month, a year, ten years, or maybe never. Other creditors *must* be paid, but the blacksmith can "trust," and yet should they look on the other side of the question they find that the blacksmith must purchase the necessities of life at the highest cash prices. Even should his own customers have produce to sell the bill must be settled at once.

Of course this latter part is perfectly right; we believe in honesty, in prompt settlement, but why then should we not also have a law to protect our rights? A law whereby we may collect our just deserts? If the farmer or horse owner has property enough to justify him in going to the blacksmith for repairs, why should this same property not be used for payment if he will not pay in any other way? For where can we find a class of mechanics or business men who are as poorly paid today for their skill and labor as the blacksmith?

I am also strongly in favor of an organization whereby we might have a universal price established all over the State. I fear that neither this lien law nor the blacksmiths' union has been urged enough among our fellow workmen. Many do not understand the value of this. If it were possible for us to have an agent to visit each smith in the county or State and explain the benefits of this law and also of a higher and more fixed price for labor, I believe that success would crown our efforts. Let us be up and doing.

We want to put our best material, our best workmanship, into all work we do, but we want also to be properly remunerated for so doing.

The Construction of Locomotive Lifting or Tumbling Shafts.—2.

W. B. REID.

To complete the lifting shaft, after the method described in our former article, the same operation is repeated in the welding of the three arms, good judgment and accuracy being, of course, requisite to the proper adjustment of the parts.

The arms in this instance being forged from bar iron, the boss has to be formed by welding, as shown at Fig. 4. While this is generally considered inferior to the piece as forged in the solid, it can be made substantial enough in this way if proper care is taken in welding the parts. In the necessary haste of piece work, however, this is not always conscientiously done; resulting in subsequent breakage and indiscriminate condemnation of the practice.

The long bent arm of the shaft is generally put on short and straight, to permit the turning of the journal, after which the arm is lenghtened and proper sets put in.

In the railroad repair shop, where the forging of a complete new lifting shaft

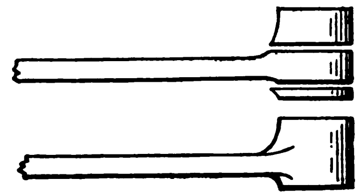


Fig. 4. WELDING ON THE BOSS.

is not of very frequent occurrence, the job could probably be done in a more convenient and substantial fashion as follows: Forge the shaft from an old axle, leaving the stock sufficiently full where the arms are to be welded on, Fig. 5A. This makes it unnecessary to upset the iron at these points and may also dispense with welding the strip around the bottom to form the collar, as was necessary in the first method. The scarfing of the shaft and the arms would also be different in this case. A deep triangular piece is cut out straight across the shaft, Fig. 5X. The arms are forged from the solid, leaving sufficient stock at both ends for the boss and scarf, Fig. 5B.

The scarf of arm should be of substantial size, to suit the cavity in shaft, see Fig. 5C. No method of welding a lifting shaft arm is superior to this, although undoubtedly it is much slower than that first described.

A third method we have seen practiced, of forging the lifting shaft, is

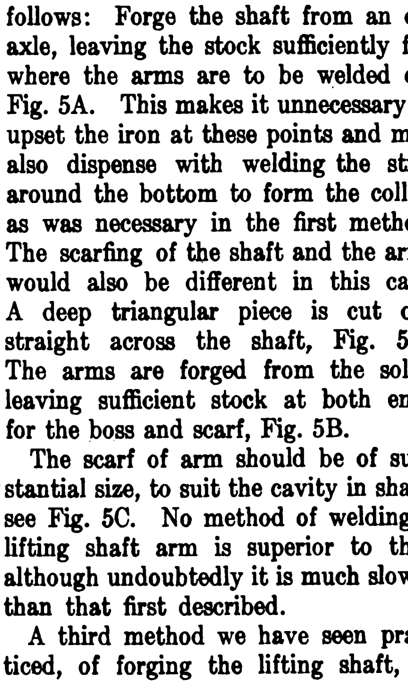


Fig. 5. FORGING LIFTING SHAFT FROM OLD AXLE.

shown in Fig. 6. Here the shaft is forged from the axle with the collar definitely shaped, and the parts scarfed and welded as shown. While this may appear very practical at first sight, experience will prove the method to be much inferior to those already described. In the first place, to forge the

shaft in this manner occupies too much time. Secondly, the welding point is too close to the shaft and of too narrow a surface to make a substantial weld. No matter how carefully welded,

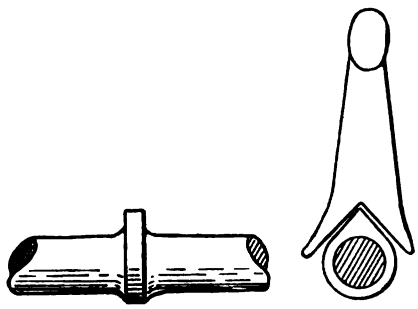


Fig. 6. ALTERNATIVE METHOD OF FORGING AND WELDING.

the parts are very liable to separate when straightening and adjusting the arm, an unfortunate condition likely as not to happen when the shaft is nearly completed.

Welded as in the first and second methods shown, particularly the second, the arm can be worked and bent with comparatively little danger of any similar unfortunate result. It may be accepted as a rule that, in all welds of this kind, the deeper the parts are embedded in each other the more substantial will be the result. Especially is it so in cases where the forging is to be machine-finished all over, a practice more common in former years than it is at present. It is hardly necessary to state that it adds materially to the stability of the forging if left black or unfinished, except at essential working points.

Many years ago, when employed as a young man in a locomotive contract shop, the writer observed a forcible object lesson upon this point which he could never forget. A set of ten passenger engine lifting shafts had, through

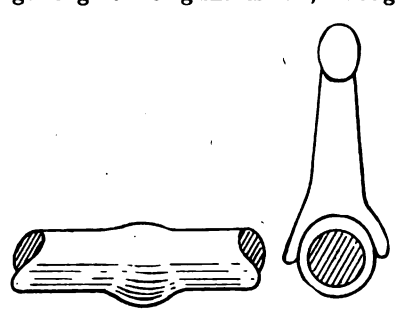


Fig. 7. INCORRECT METHOD.

some inadvertance, been made in the worst possible way, as in Fig. 7, which shows the arm scarfed in circular form and simply welded around the exterior surface of the shaft. After being "machined" all over, some imperfections at points of weld were observed. To test them the arms were struck with a sledge, when nearly all of them rolled off their bases like so many nine-pins, to the sad discomfiture and loss of the blacksmith.

In some details the designs of the lifting shafts of different classes of engines vary, but on the whole the principles of construction, as outlined in these articles, will prove of general application.

Butcher Knives and How to Make Them.

GEORGE NABLO.

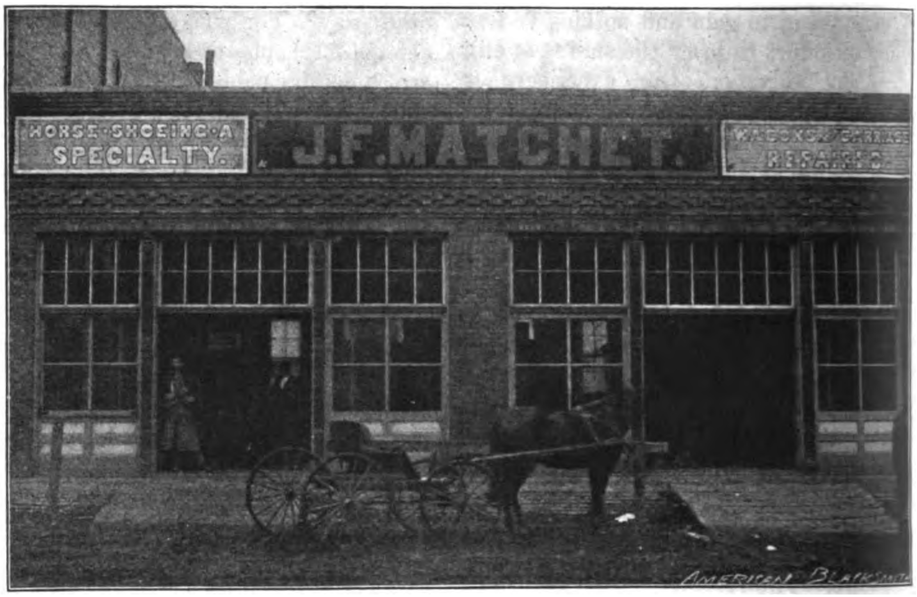
It is perhaps out of season to write about the making and tempering of butcher knives, but if those of the craft who have a little spare time this summer will care to utilize their old millsaw files to advantage, I believe that this article will be useful,—at least I have made many a dollar in that way.

The files most suitable for farmers' butcher knives are the 8-inch millsaw; that is, if made with a tang for handle. I have made a great many and prefer them to these with side handles fastened by rivets. I take the file and first heat it the whole length to prevent breaking while forging one end. I next heat the top or front end, and work it down to a tang or stem, to about $\frac{3}{8}$ inch in thickness and about three inches in length. I then turn it end about and forge the blade. I first cut off the tang on file; i. e., the old one, and forge the point, tapering from both sides equally to a point. Next I begin to draw out the blade, commencing at the point and on along the whole side. That is to form the cutting edge. In that way the knife will assume its shape, the thinning of the one side giving the natural curve.

I then continue to draw the knife to any desired thinness. After the knife is shaped, I allow it to cool in the open air until black, when I quench it in the water tank, and proceed to file it up ready for tempering. I file it almost to a cutting edge, so as to save a lot of unnecessary grinding.

When I have done filing, I proceed to the tempering. This is my method: I have a box filled with sand, 6 by 12 inches, and about 3 inches in depth, which I use, thoroughly wetting the sand all through with rain water and pressing the sand firmly down. Next I take the knife and press it with edge in the wet sand its whole width, and then take it out and heat to a good red color all over the blade, and when ready, put it in the cleft or slit of sand previously made. With both hands I press the wet sand firmly against the sides of blade, in order to facilitate the cooling off process. When cooled off, I take it out of the sand and find that the edge is too hard, especially where it is the thinnest. Therefore, I hold it over the fire and draw the temper until a millsaw file will begin to take a slight hold on the edge (a slightly worn file is best.) Then I put it in the ashes of forge for cooling. A little practice will soon enable the smith to get the right hardness.

This method has several advantages over others that I formerly used. A knife will not crack nor warp and the back will not be so brittle as when tempered all the way alike. It is not so liable to break, and the temper will be good for about the half of the width



SHOP OF MR. J. F. MATCHET.

of back, which is all that is required. I have made butcher knives for 35 years and have tried different methods of tempering, but none could compare with the method given. No matter how thin the blade is forged, it will neither warp nor crack and can be made as hard as any one may care to have it. I might say that I have the reputation of making the best knives in this county and make a great many every year.

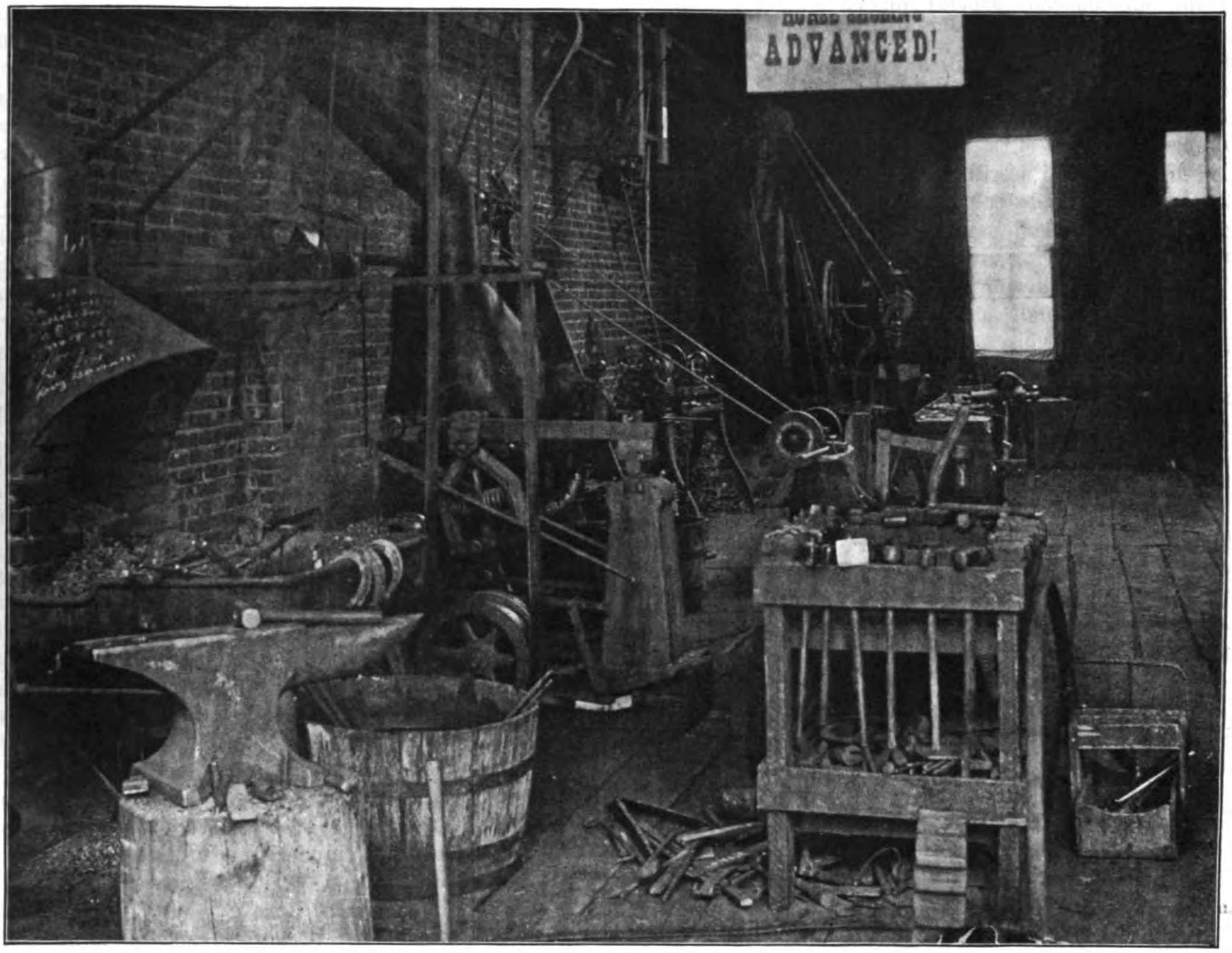
For handles, I use dry appletree wood. I do not taper the tangs, but make them of even size the whole length. I simply bore a hole in the handle, drive on the tang nearly to the blade, shape handle and run some babbitt metal on the front end, then dressing to suit.

A Missouri Shop with Good Facilities.

J. F. MATCHET.

The two pictures herewith show my shop, 48x68, as it now stands, which I believe will compare with any received by THE AMERICAN BLACKSMITH. I am situated in the county seat of Monroe County, Missouri, the population being two thousand. I learned my trade here and have been in business for forty years. I am 63 years of age, and still hammering, as in my younger days, and cannot let go. We do a business of about six thousand a year. My work has increased much with my increased facilities. The shop is in two rooms, one for smithing and one for wood work. The picture does not show the position as it should, but rather aims to give the more important parts of the business, showing the machinery which we have put in and which all smiths should have. I have a 2½-horsepower engine, made by Fairbanks-Morse, Chicago, and it gives me all the power I need. I run everything with it and have power to spare. I also have a drill, lathe, trip-hammer, emery and buffer. I also run the fans to my forges and shall, from time to time, add other machines for convenience. I am strictly in favor of machinery for small shops, and think it adds to the interest, as you will see from the sign hung up on the shop.

We also are making some improvements in prices. Having worked up an interest in the matter among the smiths of the county, we have succeeded to some extent, and have raised the prices a little. The following are some of our charges:



INTERIOR VIEW OF A MISSOURI SHOP RUN BY MR. J. F. MATCHET.

Horseshoes, plain	1.20
" toed	1.40
" setting	.70
" toed	1.00
" hand made	2.00 and 2.50
Wagon tires, per set,	2.00
Buggy tires, set	3.00
Rubber tires with channels	28.00 to 35.00
New rubber only, per lb	.85
Pointing plows, 12-inch and 14-inch	1.00
Pointing plows, 16-inch	1.20
New shares, 12-inch	3.05
" " 14-inch	3.50
" " 16-inch	3.75
Sharpening 12-inch, on stock 25, off stock	.20
Sharpening 14-inch, on stock 30, off stock	.25
Sharpening 16-inch, on stock 40, off stock	.35
Pointing the point of wing	1.00
Wagon tongues	2.75
Buggy or spring wagon pole	3.25
Splicing tongue brace	.50
Buggy shaft	1.50
Cross bar	1.00
Singletree	.50
Steel bow socket in top	1.00

Other prices are in the same proportion.

I will stop now by saying that I am much in love with The American Blacksmith, have been taking it for several years and shall continue to do so.

The Gas Engine and its Advantages.

Prize Article.

WILLET OREED.

To the question, "Does it pay the blacksmith to put in a gas engine?" I want to say, most emphatically, that it does. And why? I am proprietor of a shop in a city of 2,500, my main building being 20x80; run two fires, and do horseshoeing, general blacksmithing and rubber tire work. I have a four-horsepower gas engine, made by the Springfield Gas Engine Company, with which I run a 21-foot line shaft, a double emery wheel, a 4-foot grind stone, disc lathe and a drill.

I grind plows and tools of almost every description, and save a lot of work daily on laying and pointing plows. You can hold your work against the emery wheel and smooth it up. If you are dressing chisels or hammers it is more of a pleasure than work to step to the emery wheel, where you can grind them in a few moments. You can have all of your machinery in motion at the same time, or you can have a lever shift to change the belts. In my shop I use the lever shift for belts, which I find very convenient. If you have drilling to do, you can drill five holes by gas power to one by the old way—hand power.

I have had quite a great deal of boiler repairing. I first cut out the sheet, which, of course, is very rough edged, unless you do a great deal of filing, and when I get my sheet or boiler plate cut, I can emery it off in three minutes' time. I have had work of grinding to come in that I would not attempt or think of doing if I had no gas engine. Where one is located in a town having electric lights, almost any kind of grinding or drilling can be done neatly and with absolute safety at any hour of the night. In my shop I have these conveniences and run my engine at night as well as during the day.

As to the expense of running my engine, it has been very light; in fact, the item is so small that it is hardly worth mentioning. The batteries have been renewed only once in two years. I keep on hand two extra batteries to renew with. It will cost about $6.00 to renew a set of six. It costs me about 50 or 60 cents per day to run my engine, if run steadily. I can start my engine and machinery in half a minute, and when I stop it all expense stops with it.

Another point not to be overlooked and which is quite an item, is that it requires no engineer or mechanic to run it, and scarcely no attention need be given it, as it practically runs itself when once started. From my own experience I am safe in saying that one man can turn out as much work by the aid of a gas engine as three men can without one. I can not see how my neighbors get along without an engine. You can polish up a job and make it look so much neater and better, and that is a secret that goes a long way and makes many pleased customers, and many new ones. If I was to start a new business in any locality, I most certainly would add a gas engine in preference to steam.

Does it Pay the Blacksmith to Put in a Gas Engine?

Prize Article.

WALTER MCOOY.

After reading so many able articles in your valuable journal, a little over a year ago, I concluded to put in power, so I installed a 2½-horse-power Webster vertical gasoline engine, and it clearly demonstrated to me that it pays to put in power in a blacksmith repair shop. I prefer the gas engine for the following reasons: First, the cost of a gas engine is less than for any other power; second, it does not require such close attention as is necessary with steam; third, the saving of fuel, from the fact that unless your gas engine is in actual use it is not consuming fuel, which is not so with the steam engine; fourth, the fuel is so much nicer and easier to apply to the gas engine, and as nearly as I have been able to figure the cost to run my engine it will not exceed 50 to 75 cents per day, and has cost nothing for repairs.

At the present time I run a disc sharpener, emery grinder and polisher, trip hammer, buzz saw and wood lathe, and contemplate putting in a tennoning machine and iron lathe this spring, and I am confident my little Webster engine will handle them all.

I am located in the great wheat belt of Kansas, and therefore my principal and heaviest work is disc sharpening, plow and cultivator sharpening and pointing. During the season of 1902, before I put in my engine, I only pointed eight cultivator shovels at a price of 40 cents each, a total of $3.20, and it was very plain to see that this class of work was going by me to other places where they had power and means of polishing. Then after putting in power, during the season of 1903, I had 159 shovels at a price of 50 cents each, a total of $79.50, intimating a gain in favor of power of $76.30,—$16.30 more than I paid for my engine. My increased income, together with the fact of seeing this class of work again returning to me, is very encouraging.

Besides this, I am able to do a better quality of work now, which is more satisfactory to my customers, and the blacksmith as a rule holds a special pride when he can please his customers with good work. By the use of my trip hammer for plows I can do just as good sharpening in one half the time I take by hand, requiring only 10 to 15 minutes and from 4 to 5 heats to each lay. In pointing I weld on and draw point to edge at three heats, which with the average smith to do the same work by hand would require from five to six heats. This would mean a loss of time, expense of coal, and a lot of hard labor. In sharpening disc plows, of which there are quite a number in my vicinity, and which are almost impossible to sharpen by hand, I find it an easy matter with either disc sharpener or the power hammer. I prefer the latter as there is no waste of material.

I sharpen 14-inch discs under my trip hammer at from three to four heats. This, of course, requires careful heating and quick work.

There is a wide range of other forging done with the power hammer. It is very good for forging down axles after welding on new stubs, finishing each weld at one heat, saving of time, coal, labor, and great drops of sweat. These all lend force to the argument in favor of power.

I bought my engine second-hand. Went to the machine shop, gathered it up in pieces out of different parts of the shop, put it together, shipped it home, placed it in my shop, and as long as I feed it gasoline and oil it never fails to go when I want it to.

I built my own trip-hammer at a cost not to exceed $10, and if any brother smith is interested in such a hammer I will gladly furnish him any information I can for construction. As for shut downs, well—

My engine stopped for me one day,
Alas, he would not run;
I found that he was out of gas,
The little son-of-a-gun.

I suppose there are a great many smiths in just the position I was a year ago, undecided whether an engine would pay them or not. To such as these, let me say, get an engine by all means, and you will soon wonder how you

ever got along without one. There is everything in favor of them and nothing against, as far as I can see. Don't hesitate, but try one.

Advantages of the Gas Engine.

Prize Article.

F. A. WHEELER.

I am convinced that it pays to run a gasoline engine in a blacksmith shop, and shall attempt to tell AMERICAN BLACKSMITH readers why. I have always operated a two-man shop, first without any power, and later have worn out two steam engines, and for the past year have used a gas engine—a four horse-power Witte, made by the Witte Iron Works, Kansas City, Mo.

I suppose it is taken for granted that an up-to-date shop that contains a reasonable number of tools requires power. Then it is a question between steam and gas. I run an emery wheel, a circular saw, a one-horsepower hammer, turning lathe, spoke tenoning machine, drill and disc sharpener; also an iron saw (on same mandrel with wood saw), for cutting gas pipe, cutting teeth on stoneworkers' tools, etc.

As a general proposition it must be conceded that with these tools and a gas engine two men can do the general work four men would ordinarily do, and do it easier—therefore making the ownership of the machinery highly profitable to the employing blacksmith.

Here it will cost 65 cents to run a four-horsepower gas engine 10 hours—6½ cents per hour. When the machine is idle the expense is stopped, and your attention relaxed. It can be started in five seconds and stopped as quickly. The probable cost of operation, one day with another, will not exceed 25 cents. You run the hammer a few moments now, while you sharpen a plow, the emery wheel later to grind and polish

Fig. 13. FORGING. A, PASSING CLEAR. B, IN ACT OF STRIKING.

it, the drill, and then the disc sharpener—all little jobs. You are equipped to do all classes of work economically at the shortest possible notice, never piling up work for a convenient time to "fire up," as you do with steam.

To particularize, for instance, suppose a farmer wants a plow sharpened. Hammer it out rough (just let the hammer shape the share), then in less than five minutes you can grind it, making a better finish and doing three times as much work in a day as can be done by hand. Again, do a piece of forging. Save your time in trying to hammer smooth, but grind instead; you can do more grinding on the most of work in 10 minutes than you can file in an hour, and there is no cost of files. Suppose a man comes into your shop with a wooden pitman cast-head broken. Start your engine, go to your emery wheel, and in two minutes you can grind the head off of every rivet, and stop your engine. Then the most trying ordeal of the job is ended, and the short run hasn't cost the fourth of a cent. How many readers have turned sickle work away because they had long-back sections when the patron needed short-backs? With an emery wheel and a gas engine the longs can be made short in a mighty short time and for the fraction of a cent in the cost of oil. I will wager you can't find a man in the Union that will run a rip saw for 6½ cents per hour, yet my saw runs for that, and it will saw more wood than 10 men can saw.

More, my saw will work a minute at the same ratio, and then keep off the pay-roll until I need it again. Here is another one: I bought a hand disc sharpener last year, and it took 2½ hours to sharpen a set of discs, and it was harder work than shoeing a refractory mule. I attached it to the engine later and now I can dispose of the job in half the time, and it is very much easier.

That is the secret of the whole business. It lightens the load. All your hardest work is done by machinery. It is done economically, because it is done cheaper than you can hire it done by hand. It is done better and more promptly. Then power is essential.

A gas engine is much more adapted to job work than steam. It is always ready. There is no heat, it is much cheaper and requires less attention. The engine of today has passed the experimental stage. Aside from the battery, I have needed no repairs and a machine of the same kind has been in

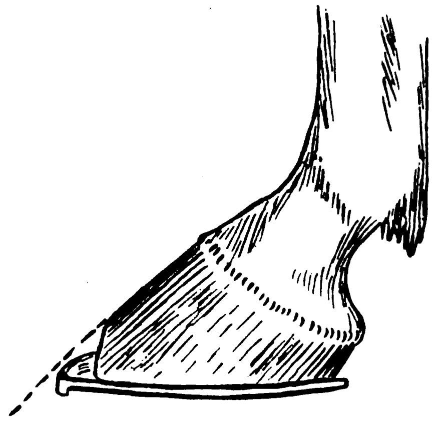


Fig. 14. TOE WORN SHORT. DOTTED LINE INDICATES NORMAL DIMENSIONS.

operation in this town for seven years without repairs of any kind.

In concluding, I advise my brother smiths to cease going to mill horseback with your grist in one end of a bag and a rock in the other, but get in line, do a larger volume of work with less help, do it easier, do it better, make more money, save your muscle,—use gasoline power.

The Practical Scientific Treatment of Interfering Horses.—6.

Forging or Clicking.

E. W. PERRIN.

Forging or clicking is a phase of interfering peculiar to line trotters—horses whose hind feet move over the track of the front ones. The pacer and passing-gaited trotter does not forge. Forging consists in the animal striking the toe of the front shoe with the toe of the hind foot on the same side (see Fig. 13B), thus making a clicking noise, which is very unpleasant to the ear. Some times one foot only is affected, generally both, but usually one foot is more affected than its fellow, as is indicated by the sound and wear of the toes of the hind feet. In horses that forge badly it is common to see the toes of the hind feet worn quite short, as in Fig. 14, as a result of constantly striking the toes of the front shoes.

Forging results from lack of unison in the locomotion of the four limbs, that is, the front limbs are out of time with the hind ones,—the horse is not balanced.

Causes.

The causes of forging are various. First, a conformation of body and limb that predisposes the animal to interfering is the most prolific cause of forging. Long legs under a short body,

or hind legs set too far under the body—too near the front legs—predisposes a horse to forge. All such horses travel dangerously close; that is, the toes of the hind feet pass closely under the toes of the front ones when trotting, and consequently anything that impedes the motion of the front feet or accelerates that of the hind, will cause the front and hind feet to collide while in motion, thus causing that clicking noise known as forging. Hence it will be seen that pain in a front foot or limb may cause forging, and this in my judgment is the most prolific cause of the trouble. It is a fact well known to all horsemen that the front feet of working horses, especially those which do fast road work, rapidly deteriorate. In fact, about 85 per cent. of all foot lameness (except that resulting from injuries), is in the front feet.

A young horse comes from the pasture with his hoofs cool and moist, wide at the heels and sound. We bring him to the city, shoe him and work him on paved streets. He goes all right for a while, but after a few months of street work, the front feet have shrunken; they are slightly narrower at the heels, and the sole that would pare as easily as a piece of leather at the first shoeing, is now as hard as oak.

The horse may not show any lameness, and to the casual observer there is nothing the matter with the feet, but a dry, shrunken condition of the hoof will cause sufficient soreness to impede the motion in front, so that the front feet are out of time—they do not raise quick enough, and hence collide with the hind ones.

The other causes are embraced under the broad head of defective shoeing,

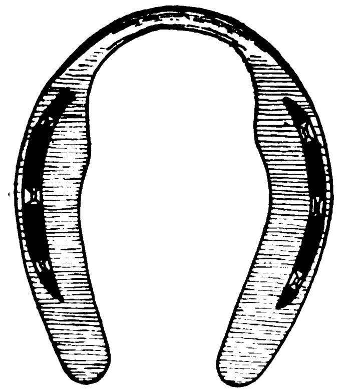


Fig. 15. A—HEEL WEIGHT SHOE, WITH ROLLER MOTION TOE.

such as improperly prepared hoofs, or the application of unsuitable shoes, or weights that do not suit, but all the defects in shoeing operate in the same way; they delay the action in front or accelerate it behind; they put the locomotary apparatus out of time—the horse is off his balance.

Treatment.

In the majority of cases the forging horse is a young one that has not been working on the streets very long. Perhaps he did not forge until his last shoeing, and the shoeing may have something to do with it, but not necessarily so, for it is common to find the hind feet sound, while the front ones of the same horse may have corns, contraction and sidebones. If the shoeing is suspected, closely examine the workmanship and ascertain if he is shod with the same pattern shoe that he wore when going clear. If the front shoes are worn thin on the outside, it is probable that you have the outside of the hoof too high, or there is some pain on the inside of the foot. Look out for a corn or a weak inside quarter. If the toes of the front feet are too long, shorten them and roll up at the toe. If the hoofs are in good condition with a well-developed frog that will reach the ground, then use shoe as at Fig. 15A, fitted so as to obtain frog pressure. If there is some contraction with a dry hard condition of the hoof, then use a heel weight bar shoe, as at Fig. 15B, and poultice the feet every night for a week, and follow that by stopping the hoofs with wet clay every time the horse is in the stable.

Now about the hind feet. It is common to see the toe of one or both feet worn very short by constantly striking the front shoe (see Fig. 14), often caused by inexperienced shoers fitting the hind shoes back on the hoof, thus leaving the toe of the hoof projecting beyond the shoe. This reprehensible practice modifies the clicking noise, at the expense of wearing away the toe of the hoof, and when the hoof is worn back to the shoe—generally in a few days—the clicking noise recurs. Remember that shortening the toes of the hind feet aggravates the trouble, because the shortening of the toe quickens the "pick up" of the hind feet. Instead of shortening the toes of the hind feet, they should be lengthened to their normal dimensions (Fig. 14.)

If the toes are too low then build up to the proper angle with layers of leather. Also use a light shoe with a toe calk and fit full at the toe so as to obtain the proper angle of the foot, as in Fig. 14.

There is a prevalent theory that shoeing a horse heavy in front and light behind will prevent forging. The very opposite is as often true. There is no rule that can be applied to every horse with success; each individual case must be studied with a view to ascertaining the cause, and although indifferent shoeing is a cause of forging, it must be remembered that sore tendons or joints, incipient splint or ringbone, sore feet, and all such causes of forging cannot be cured by shoeing alone. Therefore many a case of forging needs the advice of a veterinary surgeon as well as the skill of the horseshoer.

A Treatise on Horseshoeing.—5.

JOHN W. ADAMS, V. M. D.

Preparation of the Hoof for the Shoe.

After raising the clinches of the nails with a rather dull clinch-cutter ("buf-

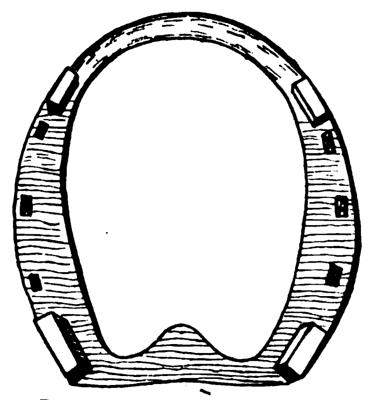


Fig. 15. B—HEEL WEIGHT BAR SHOE, WITH HALF ROUND ROLLER MOTION TOE.

fer") and drawing the nails one at a time, the old shoe is critically examined and laid aside. Remaining stubs of nails are then drawn or punched out and the hoof freed of dirt and partially detached horn. The farrier has now to "dress" the overgrown hoof to receive the new shoe; in other words, he has to form a base of support so inclined to the direction of the pasterns that in motion this surface shall be set flat upon the ground. He must not rob the hoof nor leave too much horn; either mistake may lead to injury. If he has made a careful preliminary examination he knows what part of the wall requires removal and what part must be left, for he already knows the direction of the foot-axis and the wear of the old shoe, and has made up his mind just where and how much horn must be removed to leave the hoof of proper length and the foot-axis straight.

A greatly overgrown hoof may be quickly shortened with sharp nippers and the sole freed of semi-detached flakes of horn. The concave sole of a thick-walled, strong hoof may be pared out around the point of the frog, but not so much as to remove all evidences of exfoliation. The wall should be levelled with the rasp till its full thickness, the

white line, and an eighth of an inch of the margin of the sole are in one horizontal plane, called the "bearing surface of the hoof."

The bars, if long, may be shortened, but never pared on the side. The branches of the sole in the angle between the bars and the wall of the quarters should be left a little lower than the wall, so as not to be pressed upon by the inner web of the shoe. "Corns," or bruises of the pododerm, are usually a result of leaving a thick mass of dry, unyielding horn at this point. The frog should not be touched further than to remove tags or layers that are so loose as to form no protection. A soft frog will shorten itself spontaneously by the exfoliation of superficial layers of horn, while if the frog is dry, hard and too prominent, it is better to soften it by applying moisture in some form and allow it to wear away naturally than to pare it down. It is of advantage to have the frog project below the level of the wall an amount equal to the thickness of a plain shoe, though we rarely see frogs of such size except in draft horses. The sharp lower border of the wall should be rounded with the rasp to prevent its being bent outward and broken away. Finally, the foot is set to the ground and again observed from all sides to make sure that the lines bounding the hoof correspond with the direction of the long pastern.

Characteristics of the Shoe.

The shoe is an artificial base of support, by no means ideal, because it interferes to a greater or less degree with the physiology of the foot, but indispensable except for horses at slow work on soft ground. Since a proper surface of support is of the greatest importance in preserving the health of the feet and legs it is necessary to consider the various forms of shoes best adapted to the different forms of hoofs. Certain properties are common to all shoes and may be considered first. They are form, width, thickness, length, surfaces, borders, "fullering," nail holes, and clips.

FORM.—Every shoe should have the form of the hoof for which it is intended, provided the hoof retains its proper shape; but for every hoof that has undergone change of form we must endeavor to give the shoe that form which the hoof originally possessed. Front shoes and hind shoes, rights and lefts, should be distinctly different and easily distinguishable.

WIDTH.—All shoes should be wider at the toe than at the ends of the branches. The average width should be about double the thickness of the wall at the toe.

THICKNESS.—The thickness should be sufficient to make the shoe last about four weeks and should be uniform except in special cases.

LENGTH.—This will depend upon the obliquity of the hoof viewed in profile. The acute-angled hoof (Fig. 5*a*) has long overhanging heels, and a considerable proportion of the weight borne by the leg falls in the posterior half of the hoof. For such a hoof the branches of the shoe should extend back of the buttresses to a distance nearly double the thickness of the shoe. For a hoof of the regular form (Figs. 5*b* and 8) the branches should project an amount equal to the thickness of the shoe. In a stumpy hoof (Fig. 5*c*) the shoe need not project more than one-eighth of an inch. In all cases the shoe should cover the entire "bearing surface" of the wall.

SURFACES.—The surface that is turned toward the hoof is known as the "upper," or "hoof surface," of the shoe. That part of the hoof surface which is in actual contact with the horn is called the "bearing surface" of the shoe. The "bearing surface" should be perfectly horizontal from side to side and wide enough to support the full thickness of the wall, the white line, and about an eighth of an inch of the margin of the sole. The bearing surface should also be perfectly flat, except that it may be turned up at the toe ("rolling-motion" shoe, Fig. 5 *a*, *b*, *c*). The surface between the bearing surface and the inner edge of the shoe is often beaten down or concaved to prevent pressure too far inward upon the sole. This "concaving," or "seating," should be deeper or shallower as the horny sole is less or more concave. As a rule strongly "cupped" soles require no concaving (hind hoofs, narrow fore hoofs.)

BORDERS.—The entire outer border should be beveled under the foot. Such a shoe is not so readily loosened, nor is it so apt to lead to interfering.

FULLERING.—This is a groove in the ground surface of the shoe. It should pass through two-thirds of the thickness of the shoe, be clean, and of uniform width. It is of advantage in that it makes the shoe lighter in porportion to its width, and, by making the ground surface somewhat rough, tends to prevent slipping.

NAIL HOLES.—The shoe must be so "punched" that the nail holes will fall directly on the white line. They should be confined to the fore half of front shoes but may occupy the anterior two-thirds of hind shoes. For a medium weight shoe three nail holes in each branch are sufficient, but for heavier shoes, especially those provided with long calks, eight holes are about right, though three on the inside and four on the outside may do.

CLIPS.—These are half-circular ears drawn up from the outer edge of the shoe either at the toe or opposite the side Ball. The height of a clip should equal the thickness of the shoe, though they should be even higher on hind shoes and when a leather sole is interposed between shoe and hoof. Clips secure the shoe against shifting. A side clip should always be drawn up on that branch of the shoe that first meets the ground in locomotion.

(To be continued.)

Corns and Their Treatment.

DR. HERBERT L. PARKER.

The term corn refers to a diseased condition of the posterior part of the foot, and especially of the heels. The injury has its seat in the sensitive structures of the quarters, in the sensitive bars or in the sensitive sole. They are divided into two classes, moist and dry, and are shown by a red spot at the heel.

CAUSES: The fact that the posterior part of the hoof is often the seat of the trouble, is possibly due to the great

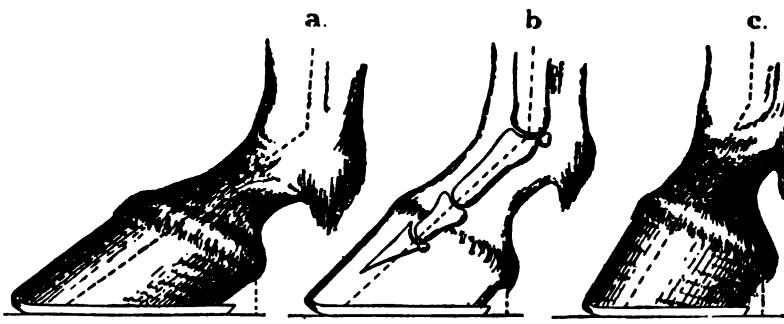


Fig. 5.—*a*, SIDE VIEW OF AN ACUTE-ANGLED FOOT (SHOD); *b*, SIDE VIEW OF A REGULAR FORE FOOT, SHOWING THE MOST DESIRABLE ANGLE OF OBLIQUITY (45°); *c*, SIDE VIEW OF A STUMPY, OR "UPRIGHT" FORE FOOT; OBLIQUITY ABOVE 50°. IN *a*, *b*, *c*, NOTE PARTICULARLY THE RELATION BETWEEN THE LENGTH OF THE SHOE AND THE OVERHANGING OF THE HEELS. NOTE ALSO THE TOE ROLL OF THE SHOES.

mobility. The movements of the hoof are most apparent at this point and rupture of the soft structures therefore more liable to occur. Then again, the heels carry a larger portion of the weight and the horn covering them is the weakest.

The more frequent occurrence of corns in the inner heel and in the fore feet, must also be referred to the great weight borne and in the greater concussion during rapid movement. Corns are favored by long, weak fetlocks, and by defects in formation, especially in the fore limb. In animals that stand with feet well apart, the inner heel is most generally affected; in the opposite conformation, the outer. The weaker the horn at the heels, the more readily do such injuries occur. Rings on the surface of the heel suggest the existence of a corn. Abnormally narrow feet are generally the seat of corns, and in contracted heels they are almost always present, but wide hoofs are also liable to them; in such cases the corn being an injury of the sole, while in narrow hoofs the wall is more often affected. The principal external causes are faulty shoeing, especially improper paring, the use of too long or too narrow shoes, or allowing the shoes to remain on the foot too long.

As corns are rare in unshod feet, the idea is held by many that they are produced by pressure of the shoe, and for this reason farriers often endeavor to prevent the injury by rasping away the inner wall so that it no longer touches the shoe. The result shows, however, that the idea is wrong, for corns occur just the same, and in addition a sand crack often forms at the coronet. It therefore seems clear that the heel should be supported by the shoe; if not, it descends and leads to a rupture of the soft parts.

TREATMENT: The immediate cause must, if possible, be removed, and the shoeing receive attention. For horses with broad, flat feet, the shoe should be fitted long at the heels, and should be broad over the cover. In a moist corn, after it has separated, a bar shoe would be all right. On the other hand, horses with high, blocky feet often go better in tips. The three-quarter shoe is good, the branch of the shoe being cut off on the side corresponding to the injury. The three-quarter bar is also recommended. In dry corns nothing further is required. Paring out the corns is undesirable and even injurious, because, after removal of the reddened masses of horn, the soft tissues are often exposed and infectious matter can enter the foot, such as sand, dirt, rocks, etc. In moist corns there must be good drainage for pus, and all dead tissues removed. Flaxseed meal poultices, iodine, carbolic acid, turpentine or any good antiseptic poured into the opening is good. Protect the opening from dirt. A good treatment for moist and dry corns is a few iodine scales placed over the corn with a little turpentine poured over it, holding it there for a moment.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Shoeing Crooked Feet.—I would like very much to hear from some of the craft on how they go about shoeing feet that are crooked. WM. MCKEEVER.

Cold Tire Setters.—I would like to ask some good brother which is the best and most practical cold tire setting machine for a common repair shop. WILLIAM DARLING.

Sand Belt.—As to Mr. T. L., in the May number, will say he can get a sand belt from the Sligo Iron Store Co., St. Louis, much cheaper and better than he can make one. J. V.

A Number of Questions.—I would like to ask, through the columns of the AMERICAN BLACKSMITH, how to turn a solid eye; also the proper way of making vessel rudder irons. Any information given will be greatly appreciated. A. W. HARVEY.

Milling Machine.—I wish some of the craft would send in for publication plans for a small hand milling machine for metal—also a wood working machine for cutting grooves, something on the order of the Union Combination Saws, only more simple than that. WM. DUFF.

Petroleum in the Forge.—I notice in the January issue an article on an axle factory using petroleum in the forge, because it is free from sulphur. Can some one advise as to the best way to use the petroleum, and how much would be required for an ordinary forge per day? Also does petroleum furnish sufficient pressure, or is a bellows or blower required as with coal fire? T. M. MAY.

A Testimonial.—I am delighted with THE AMERICAN BLACKSMITH—it is the best paper of the kind I have ever seen. I know it will be a great benefit to me. Have just received the hoof knife that you offer to induce smiths to take the paper. It is a splendid knife and I am proud of it. Much obliged. C. S. POINTEL.

How Drill Chilled Mould Board?—I would like some reader to kindly inform me through these columns, by what process I can drill holes in a chilled cast mould board of a plow. In a recent issue I saw camphor gum and turpentine recommended, and tried it, but it would not do. Perhaps I did not use it the right way. I have some to drill now and would like to hear from some of the craft. J. B. JEX.

Plow Lays–How Harden?—We have had trouble this spring in hardening plow shares or lays, and would like to ask some reader to help us out. We use a barrel of rain water with a compound in it, and have just had it removed this spring. The lays crack in the throat. We use the Star No. 1 lay, and always had good results until this spring. Will some one tell us a good way to harden them so they won't warp or crack? The paper is all right and we wouldn't be without it. JACK.

A Seedy Toe.—I have a mule to shoe that has a seedy toe, or that is what I suppose it is. The mule is three years old, and its hind feet have grown extra long, running out in front. The hoof is hollow in front nearly to the hair, and the heels have gone forward about $\frac{3}{4}$ of an inch. The hoof grows in front, but the heels do not grow towards the ground. The toe cannot be cut down so as to put the foot in shape. I have cut to the quick, and the toe was too long for the heel. Let me know what to do in this case. M. L. CHUNN.

To Shoe for Interfering.—I saw several questions of late asking how to shoe a horse to keep him from interfering. The following is my experience: If the horse's foot is low on the inside and turned out at the toe, I take an old shoe, cut it off at the front hole one-half inch, draw to a slope from the heel to the toe, and weld on the inside of shoe. If low on the outside, reverse it. I have been shoeing this way for several years and have never failed to stop the interfering. J. B. PRIDDY.

Blueing Steel.—In reply to R. B. Thompson about blueing, would say that I work for the American Gas Furnace Co., of Elizabeth, N. J., who build furnaces for blueing articles of all kinds and give a certain depth which lasts some time. Also case hardening furnaces are made and no doubt Mr. L. M. Emig would be able to get something to suit him there also. Then again there are furnaces for melting soft metal or hard metal and perhaps Mr. S. J. McDonald would find it to his advantage to try their furnaces. If either of these gentlemen think it worth their while, they might write to the American Gas Furnace Co. G. G.

Prices from Indian Territory.—Not seeing anything in the paper from the Indian Territory, I thought I would send in a few of our prices:

Shoeing, plain	$ .25
" rough	.35
Resetting shoes, per pair	.25
Wagon and buggy tongue	2.50
" axles, front	3.50
" " hind	3.00
Setting buggy tires	3.00
" wagon "	2.00

As the plows which we sharpen vary from six to sixteen inches, of course there are different prices.

We are of the same opinion as A. M. McGeary, of Colorado, with regard to the Lien Law, as we have suffered considerably from losses in collection, and would very much like to see the time when we could all have the same protection.

W. M. COOPER & SON.

Axles and Dish.—Mr. R. O'Hearn asks why I take two heats on an axle. This is to make a better job, as I do not call it a good job if you can see the weld. He also

criticises my method of taking dish out of wheels. Won't a wheel look better with half the spokes turned, than it would with a 2½ or 3 inches dish? I think it would. Of course it would look better new spoked.

Mr. O'Hearn, I notice, says that every article ought to be criticised if not of the best. Now, he says in his article that he pounds or strikes the end of the flange to take the dish out of wheels. I don't think this would do much good on a wheel with 2 or 3 inches dish. Also how about the Warner patent shell band wheels? I am a young smith, so I will leave this for some one else who I think knows more than us both. C. D. Briddell.

Gas Power.—I have noticed several articles on power in the shop, so have decided to give some of our experiences. We put in a six-horsepower gasoline engine about seven months ago, and kept adding machines, until now we have more than it can pull. We decided to get a larger engine, but could not see our way until work picked up, so we bought a 1½-horse second hand engine to help out. We do a great deal of finish work for the jobbers of Kansas City, Mo., and Kansas City, Kansas, which is paying for the machinery, and some over besides. We have now seventy-five oak wagon tongues in the shop to finish for a jobbing house across the State line, also thirty finished tongues in stock that we sell for less than jobbers' prices on rough tongues. Our greatest mistake in putting in power in the shop was in buying too small an engine. At present we have 7½ horse-power, but have ordered a fifteen horse engine and hope soon to have power enough for all purposes. T. M. May.

A Letter from Maine.—I run my shop without power, as a woodworking mill is at hand and all such work is cheaply done there. I use a Henderson tire setter with perfect satisfaction and would not be without one. I notice several smiths give a list of prices they get for work. They however, do not make it quite plain to us what they do for the money. The following are some of my prices:

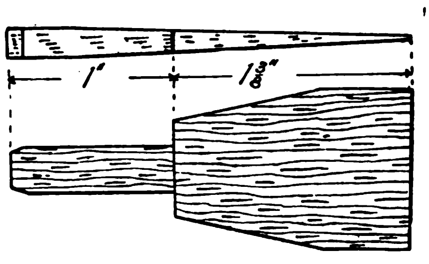
Setting light tires, per wheel	$ .25
" heavy " " "	1.00
Putting in shaft	1.50
" " whiffletree	.75
" " crossbars	.75
Rimming light wheels, 1½ and under, per wheel	1.25
Putting in spokes	.20
New axles, per set	5.00–6.00
Good painting job	7.00–10.00
Recovering buggy dash	3.00

S. L. Lord.

Sarven Wheels.—Mr. M. A. Foster says that he has built and repaired wooden hub wheels, also Sarven flanged wheels for a good many years, and has found by experience that a good wood hub, such as white oak or birch, will surpass any flanged hub for the simple reason that so many smiths' don't understand repairing the Sarven hub. I commenced work in the shop when 12 years of age, and I have repaired a few Sarven hubs in my life. The reason why the flange springs and the spokes get loose is that when riveting smiths use too light a rivet and then they think it must be set down with a sledge. There is where they make their mistake. When you use too heavy a hammer you bend your rivet, and when the strain comes on the spoke it straightens the rivet and that is what makes your spokes loose. A wood hub is all right for a level country, but in mountains it is no good. That has been my experience. C. W. Metcalf.

Butcher Knives.—In reply to Thos. Long and Samuel Krebs, inquiring how to temper butcher knives *so as not to warp*, would say I wish they would try my plan and let me know how they like it. Heat to a cherry red and plunge into fish oil (any kind of fish oil will do), and they will come out as straight as before put in, and as hard as though plunged in water. Then heat a piece of flat iron, and after cleaning the knife bright with sand or brick dust, hold the knife over the hot iron with the back of knife resting on the iron and the edge slightly elevated, as the edge, being the thinest, if laid flat on the iron, will heat the quickest. Draw to a color between a deep blue and straw color. In drawing temper be very careful and get it even, but if it should draw to the right color in part and not all over, cool off and place the part not drawn down on iron as before. After trying this plan please let me hear from you through the columns of The American Blacksmith. G. M. Goudey.

Sarven Wheels.—I saw in the April number the method of Mr. O'Hearn for taking the dish out of Sarven wheels. I don't believe Mr. O'Hearn or any other man can make a solid wheel by closing the flanges and tightening rivets. They are still loose in the wood part of the hub and will work the same as a joint. I have tried everything, even to taking off the flanges and canvassing them, and never made a wheel tight until I commenced to wedge the same as a wood hub.



TWO VIEWS OF WEDGE FOR WHEEL REPAIRING.

My method of straightening Sarven wheels is to cut four opposite rivets, draw eight spokes and wedge the same as wood hub. The sketch herewith is that of a wedge made for the purpose. Put the bolts in to hold the flanges, cut other four rivets and wedge the other eight spokes, put in new Sarven rivets and you have a solid wheel. I always use glue. I always make the wedges in the winter. I have bought factory wedges for wedging spokes, but threw them in the fire, as they are no good whatever. E. H.

Plow Lays.—We are readers of your valuable paper and don't think we could well be without it. We have watched earnestly to see if some brother smith would tell how he makes a plow lay, but have been disappointed, so will explain how we make a lay. First fit the lay to the mould, seeing that it fits perfectly. Then fasten it to the frog with a screw clamp and fit the landside bar, being careful to fit it perfectly to the lay, getting it level with the bottom of the long bar and the same on the outside. We are then ready for welding. Take an "Ideal" plow clamp, and clamp on the point. Begin welding at the top and weld to the point, using borax on the steel, but none on the iron. After welding, see that the edge of the lay presses along on the leveling board, and have the point perfectly level. Grind up, and you have a share that will run.

We have a gasoline engine, 3-horsepower, with which we run a band saw, emery wheel and other things, and would not be without it, if only to run the emery wheel, for you can do your work ever so much better. Oberg Brothers.

A Simple Axle Gage.—I wish to say that The American Blacksmith is a great help to me. I read each month with interest a good many articles on horse shoeing, axle and tire setting, wheelwright work, etc. I see in the May number where Mr. Breckinridge gave us a good talk on building wagons. I build a lot of new wagons and agree with him, only I have thin poplar patterns for all new work.

I have an axle gage that is very simple and find it to be the best yet, I think. It is nothing but a straight poplar piece 6 feet long, 5 inches wide and ¾ inch thick. Hollow out one side of gage, beginning about 12 or 14 inches from each end. This is for arched axles. Use this hollowed-out side for bottom side. On one end have two screws of the same height, say ¾ inch, and one screw the same height on opposite end. This will give bottom gather. Now, this is for common axles, but if you are setting patent axles the shoulder, of course, is swelled or larger, so have your collar screw 1-32 inch shorter. For front gather on common axles, have all screws the same except the end screw, which should be 1-16 inch shorter. For patent axles have same length screws on each end. Try this, for it is O. K. Eugene Middlebrooks.

Axes.—Having been a reader for only a short while of your valuable paper I already do not see how I could do without it. I especially like the Queries and Answers column. In answer to R. Moore in the April number on axes, as I have drawn out and steeled many thousand in the last fifteen years with excellent success, I will say to draw out an old axe be careful never to get the axe too hot, and never to stave the steel, but draw it out and trim the edges with a sharp cutter. Any experienced smith knows that staving or upsetting ruins steel. An axe can be made much thinner than factory axes are when new. Never make an axe too square on the edge, but round the corners off well after the axe is shaped up all O. K. Then hammer well with water. Let axe cool off and then file to a good shape.

To temper, first prepare the fire and heat on top of fire to an even cherry red as far or nearly to the eye. Then be careful to hold the axe with the edge straight down when dipping in water (rain water is best). Cool off to about one inch from edge and then hold edge over the fire until it will burn a shaving when hammer handle is scraped over it. Then plunge into water. If properly done ninety-nine out of each hundred will stand any kind of temper.

For steeling axes, cast steel is best. Split axe and put steel in, weld and finish as in old axes. H. L. Kibler.

Flue Welding.—In further regard to our recent question on the matter of flue welding would say that we chamfer our old flues as well as the tips in a lathe, so they fit close together, and we generally have no trouble to weld them, but we had at intervals sometimes a set that were just as stubborn as they could be and it seemed that the heat could not be gotten to proper welding point. Then again when up to what appeared the proper heating point the tip would not weld solidly to flue anyhow, or at least would not stand the test that we put all flues to before we put them in the boiler, which is to fill the inside with water and lightly tap the weld in search of leak or loose joint. Have sometimes put fault to the fire not being good, too dirty, or not having the proper blast, yet it seemed after cleaning and putting in best

of shape no improvement would follow. At other times it would be playing to do the welding on another set of flues. We have tried different welding compounds or fluxes, but it does not seem to change things materially. Generally sand is the proper flux. Now, if you can get some light in this matter, we shall certainly be much obliged. We have been in the business, that is, doing general machinery repairing, for ten to fifteen years, and do quite a lot of flue work and when we occasionally get such a stubborn set of flues to weld, it gets very aggravating to not be able to locate a remedy. We weld in the fire, using good smithing coal and a power blower. J. M. K.

A Tire Setter Testimonial.—I am highly pleased with your journal and am sorry that I have been missing so much useful information. I noticed in the April number that a subscriber wishes some information in regard to cold tire setting. I wish to say I am using a Henderson Tire Setter, manufactured by the Standard Tire Setter Company, of Keokuk, Iowa, and to say that I am highly pleased with it is to put it mildly. This is the third season that I have been using it, and it has never disappointed me. I have set all kinds of tires with it from $\frac{3}{4}$ by $\frac{1}{8}$ to 3 by $\frac{1}{2}$, low separator wheels and high hay rake wheels. I bought the machine on a ten days' trial and the first tire that I set was $1\frac{1}{4}$ by $\frac{5}{16}$-inch and I made it $1\frac{1}{4}$ larger than the wheel by actual measurement as I thought I would give it the limit. It set the tire just as smoothly as if it grew there. The beauty of this machine is that it does not disturb the bolts and leaves no marks of any kind on the tire or felloe. For setting a tire on a wheel that is dished the wrong way, why it is a "cinch." Another desirable feature is that it can be used as an axle box press. I have set boxes $3\frac{1}{2}$ by 10 inches. I bought the second one that was sold in the State of Ohio and I looked the matter up thoroughly in regard to durability and wide range of work. The "Henderson" will last a life-time, as there are no small parts to break or wear out, and it will set a greater variety of tires than any other machine on the market. The logical conclusion is that for a general repair shop it has no equal. My customers are perfectly satisfied and I know I am. It will be the same with all of the opposition if they purchase a good machine. It is my candid opinion that a repair shop without a tire setter is behind the times. My helper and I have set thirty-five tires and twenty horseshoes in one day. I would further say that you can soon pay for such a machine, not only by setting tires, but by the increased amount of other work you can do, and by the time saved, to say nothing of tire bolts, fuel and the cost of hired help. JACOB SUTER.

More on Pitch and Gather.—It has been said that pitch is good for gather, and to prove this one gentleman exhibits a ring moving in a straight line over a smooth surface and says: "It will continue in this straight line as long as it stands straight up," and as soon as it begins to pitch, you will have to give gather. He further asserts that a buggy wheel would do likewise. Suppose, however, that a buggy wheel was set in motion over a smooth surface with sufficient force to cause it to move in a straight line; it will be found to pitch towards its face in much the same manner as it does on the buggy, and why? Because on account of the dish in the wheel the weight of the hub and spokes are thrown to one side of the center of this ring, and in order to balance itself it must pitch; as soon as the speed permits it to straighten up it will commence to gather. Mr. Youngstrom seems to have overlooked the fact that there is anything to the wheel but the ring, and to clinch his argument he produces a wheelbarrow and proceeds to cut the figure eight and other graceful turns. Then he moves the bearing slightly out of true, like he does when he gives gather and says that you could not push this wheelbarrow straight ahead unless you gave it pitch. But let us see. Suppose you had two wheels on the wheelbarrow, and moved the two outside bearings slightly ahead, you would then have the exact position of the buggy wheels, the spokes standing plumb, from hub to floor, with the wheels narrow in front. In this position you could push them straight ahead, but they would run together. It has been said that we give pitch to prevent gather, but that is not the exact truth. We give pitch to stand plumb and omit gather to be straight on the side. I could refer to a score or more carriage factories that do the same, but one will suffice. Write to Mr. D. W. Connell, Velie Carriage Co., Moline, Ill. He is a practical man, has worked his way up from behind the anvil to superintendent of one of the largest buggy manufactories in the country, a concern that builds something like 20,000 jobs a year, and I am sure he would tell you that he knows of no large concern that uses gather in light vehicles. Nor is this a new idea. I learned it just 15 years ago. The assertion that the tire will produce friction with the ground is absurd. To do this the wheel would have to slack its speed and drag, and if the nut was off it would drop off. That such is not the case has been demonstrated by setting the axle so that the spoke stood plumb, leaving the gather out. You can push the job ahead, or run it backward over a level floor, and the wheel will never leave its position at the collar as long as it continues in a straight line. NELS PETERSON.

Flue Welding.—In reply to an article on flue welding by J. M. K., in the March number, I will say that I have had over twenty years' experience, both in hand and machine welding, and the only trouble I have ever had has been with galvanized flues. With ordinary flues of steel or iron I have never had any trouble. It is difficult to tell where J. M. K.'s trouble lies, from the fact that he does not describe his method, does not say whether he welds them in or out of the fire, or whether he puts the safe end on the inside, or uses both top and bottom swage, or how his mandrel is arranged. He also neglects to state what kind of fuel he uses or how he manages his fire. All of these things have much to do with welding flues and without knowing where his difficulty lies it is difficult to suggest a remedy. The following is my method:

For hand welding, I put the safe end on the outside, making a very short scarf on the end of the old flue, and choking it just a trifle so that it will readily enter the safe end. I go over all the flues first and stick them up handy to get at. Next I scarf the ends on the horn of the anvil, enlarging them slightly. Put the end back in the fire and get the end of it a nice heat; put it on an iron block which is level with the floor, hot end up. The helper has the flue ready and drops it into the end and jars it down till it is lapped $\frac{1}{2}$ or $\frac{3}{8}$ of an inch. Then while still standing on end, with a light hammer close the thin scarf of the end down close against the flue so that there is no open place for dirt to sift in while taking a welding heat. This joining process must be done very quickly, else it will get too cold for good results. When all the flues are ready for welding, I build a fire with block and pound down wet coal as hard and solid as possible. On each side I put fire bricks, if I have them, and if not, use wet coal for banks. I feed the fire with hard coke if I can get it. If not, I use ordinary coke taken from the fire. In heating I begin with an ordinary blast and gradually increase, finishing off with quite a fierce blast, as there is no danger of burning off the flue if careful to have a good body of coke under it. When a welding heat is reached have the helper hit it on the end enough to stick it, and be careful that the end is kept in line with the flue. When a good soft welding heat is reached, with a small hammer having an iron handle, weld the thin scarf down all round. Do not do this till a good heat is reached. This process will choke the flue slightly. I use a steel mandrel hung loosely (except that it cannot move endways) at the farther end and having a short sharp point at end over which the flue goes. This mandrel lies in a bottom swage, which is chamfered on the end so that the flue will not catch. Take from the fire, slip onto the mandrel and weld with four or five blows from a five or six pound hammer in the hands of the helper. H. CHISHOLM.

Hardening Query.—I am employed as a tool dresser in a railroad shop and am seeking a little information. I have had very good success thus far, having an "American Steel Worker," by E. R. Markham, but see no remedy for the following in his book: Our boiler shop uses the large size Monarch pneumatic air hammer for calking radius stay bolts on the crown sheet. We make the cup carefully, but it is impossible to make them stand. How am I to harden to avoid their breaking? They either break at the bottom of the hole or shank, or the shank that goes in the hammer breaks. The hole is $1\frac{1}{2}$ inches deep. We will say that Markham's book is the only thing for a hardener of tools. We have also found good information in your journal. ANDY RITTER.

In reply to the question of Mr. Andy Ritter, would say, in the first place do you suppose you are using the right pressure in your pressure system? If so, you may possibly be using too high a steel, that is, one containing too high a percentage of carbon. Would suggest attention to these matters. When forging the tools do no forge at *too low* a heat, as it ruptures the steel and makes it weak. Of course I do not advocate heats that are too high, but forging heats can safely be considerably higher than hardening heats.

After forging and before working be sure to thoroughly anneal. Do not anneal by heating red hot and sticking in cold damp lime, as many do, as this makes the steel brittle and liable to break under shock. Neither should it remain red hot long, but follow instructions given in the "American Steel Worker," page 73, for annealing between boards. When hardening, heat to the lowest heats possible and dip in warm water, as warm as it can be made to do the work. If this does not prove to do away with your trouble dip in a mixture of equal parts of sperm oil and tallow, or it may be necessary to add a little resin. I think, however, you will find warm water will put you right, provided you have observed the other instructions. The annealing will put the forging in good condition for hardening, as well as remove the tendency to break in shoulder from brittleness. Be sure to look to your air supply, as too great a shock on the hammer from too high pressure is serious. E. R. MARKHAM.

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Unwrapping Your Papers.

It seems a small matter to make this subject of an address to AMERICAN BLACKSMITH readers, yet perhaps the following hint may profit some. It refers to opening the paper when received. Remove the wrapper by slitting with a knife, taking care not to cut the journal itself. Then to straighten out, roll it carefully and firmly backward once or twice, as may be necessary. The paper can thus be made to lie out flat and without crease, well repaying the slight care needed to accomplish the result.

A Suggestion to Smiths.

Blacksmiths and wagon builders who are about to invest in any tools or machinery will always do well to send for the catalogues and prices of competitive manufacturers before purchasing, as much can often be saved by so doing. THE AMERICAN BLACKSMITH is in constant correspondence with reputable manufacturers of all kinds of blacksmith's tools and supplies. If the smith who is thinking of buying will write to the AMERICAN BLACKSMITH Company, stating what he wishes to purchase, we will put him in correspondence with several firms that can supply his needs, thus saving him the trouble of writing many letters. Oftentimes the blacksmith does not know who makes the tool he wants, or when he can get it, and in such a case, also we shall be glad at any time to help our readers. The AMERICAN BLACKSMITH Company has no goods to sell, outside of a few books, and is interested in the sale of no tools or machinery. The above suggestion is simply an offer of our services, without charge, for the convenience of readers.

Pass It Along.

If you have been taught any specially useful kink in your work, remember to teach others as you were taught. If through skill, ingenuity or experience you have learned a way of doing some job or piece of work quicker, better or cheaper, don't keep it to yourself—pass it along. Of course there are mechanics who prefer to keep new ideas to themselves, being governed by no other motive than selfishness. Fortunately for the good of the craft, most smiths are broadminded and generous in such matters and freely give the information which comes to them by experience and experiment. Others learn from them and they learn from others, in turn. Knowledge of any kind would not advance at all if everyone kept to himself the lessons he learned. Hence we say if any reader knows of a shop kink or short cut that would benefit his brother craftsmen, let him tell it to them by sending it in to THE AMERICAN BLACKSMITH for publication and circulation. If you have gained any special knowledge of this kind, give publicity to it through these columns. Pass it along.

Old-Time Blacksmithing.

PROF. AMBROSE S. OTTEY.

I went to learn my trade in 1859, with my father, and I am still pounding away. Blacksmiths are a class of men that strike, but never go on strike, for there is no use of it. When they work they are always on a strike.

We were past fourteen years of age when put in the shop by our father, because we were too troublesome or mischievous to be allowed to go to school, which fact we have had occasion to regret many times since. But we have tried to educate ourselves, and during a constant labor of some thirty-six years, we have written not less than nine books on the Bible alone. This was done at night, after our day's work. The Bible, outside of our trade, is our "hobby." We have read it through one hundred and twenty times.

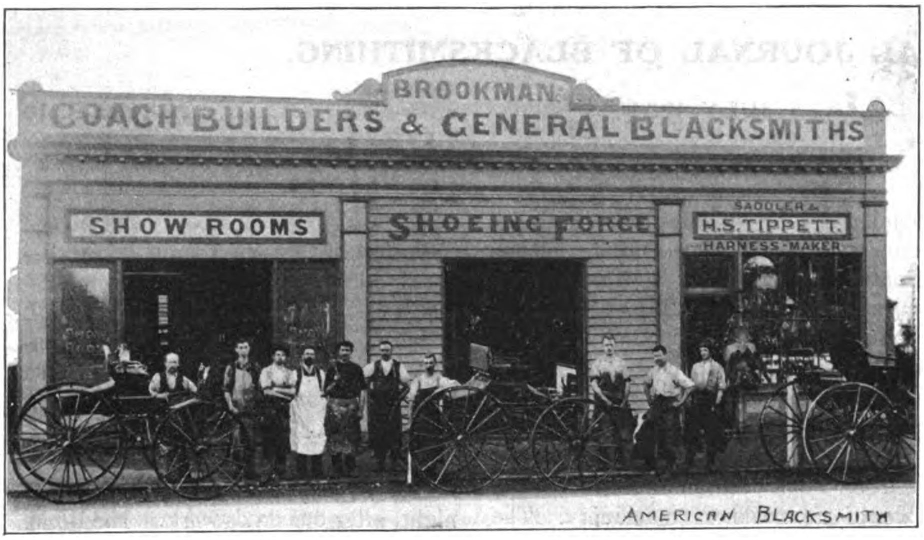
Three days after we entered the shop, we had to clinch shoes, and in six months time we were doing the fittings, while the new boys were doing the former. We were a family of blacksmiths from 'way back—the grandfathers, fathers, sons, and uncles and nephews, twenty one of us altogether.

A blacksmith, I honestly think, stands today, and always had stood, pre-eminently above all other mechanics, because he can make all of his own tools and those used by other tradesmen. What a wonderful change there is today in doing our work from what it was forty years ago! At my time of apprenticeship we made all of our horseshoes, and oftentimes made them while the horse was waiting to get shod. Then we made all of our own horseshoe nails and, before using, had to point them on a pointing block set in a post with a seat back of it to sit on.

In summer times we had to be in the shop at work before six o'clock in the morning, and work till sundown. The only time off was when eating our meals. In winter we went to work at sunrise, and worked till dark. After supper we went back into the shop and worked till eight o'clock. The work done after dark would be drawing molds, nail rods, etc.

One night's work consisted in drawing one dozen molds, or sixteen feet of nail rods. Oftentimes through the day in winter, the same work was done. For a day's work in molds we had to turn

seven dozen ready-made molds, or six dozen out of the bar, one dozen allowed for bending. For two or three weeks at a time in October or November, not



AN INTERESTING AUSTRALIAN CARRIAGE AND SHOEING SHOP.

much of anything else was done, yet all through the winter the drawing and turning was continued.

To complete a day's work in horseshoe nails one thousand of them had to be made, and hundreds of pounds has the writer made, and he could generally complete his day's work by three or four o'clock, after which we were free to go and enjoy ourselves if we so desired.

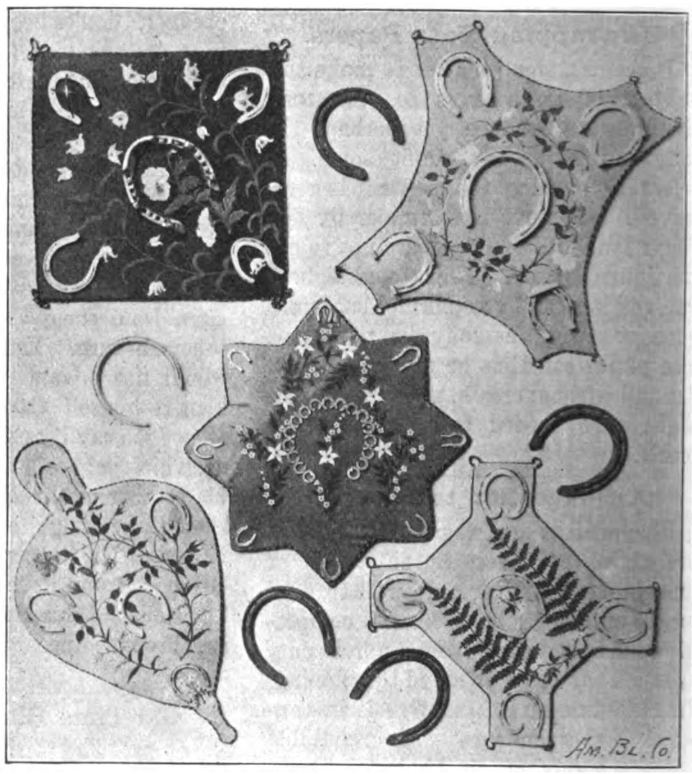
When making shoes I never cared much for using the hammer, but generally used the sledge with which to do the striking. Mr. Malin, whom I helped, was a first-class shoe turner, and we could be done with our day's work by one or two o'clock p. m. I have been in business for thirty-six years, but have never as yet had a man in my employ that could do it as well as he could, nor make the number of nails in a given time, and nine out of ten could not make a good nail, let alone a better shoe. In making nails, it took about forty strokes of the hammer to make it, so one thousand a day, would be forty thousand licks struck.

The first thing the boy had to do when learning the trade was to open the shop, make the fires, get in the coal, cut wood and get water. The boy advanced probably after serving from three to six months, and would then be put at the fire drawing old horseshoes, making chains or hinges, of which many were made in those days.

The reason the blacksmiths are not as busy now as they were in times past, is because they buy nearly everything ready made. Of course, there are not the plows, cultivators and wagons to repair as there were then.

The price paid for horseshoe nails, even at this time, would pay a good nail-maker to make them yet, as he could make very near as good wages now as they did then. The journeyman had to be a very good workman if he got over nine and a half dollars a week.

The boys got their board and clothes, very often the old ones of the boss, and sometimes his old hats or shoes he had probably worn for years. The next year he would get, according to his advancement, thirty dollars, but no clothes; the next, forty; the next, fifty, and if he had been a good, industrious fellow, would, when free, get a freedom suit, that is, new clothes from head to foot, costing probably eight or ten dollars.



SAMPLES OF FANCY SHOE TURNING.

In shoeing horses we then used the butteris, which has gone out of fashion because of the supposed danger in using them. I have not used the tool for the last ten years, because a better tool has taken its place.

In shoeing horses in those days, when a bad horse came to be shod, especially a bad kicker, the only alternative was to run and catch his foot, and when you got a hold, to hold on. Of course the twist was often used, but it was not always successful. It made some of them worse and now what a wonderful improvement has been made on this line.

In putting on tires at first, we bent all of our tires on a half-moon shaped block of wood, bolted up against a post with a clevis and a pin at one end of it. Did not know what a tire bender was; and well do I remember when the first shrinker was brought and put up. It was looked at as a wonder by all who saw it, yet it was one that was fastened about seven feet from the ground, with the lever overhead, and you had to lift the tires to it. All tires were cut and shut before this. All drilling was done on a large frame made on the order of an upright wheel trestle, with a long lever at the top with heavy weights hanging on one end. The drilling was done with a frame made in the shape of a large brace, pointed at the top end. Then there was what was called the "devil," which was put against the breast to do the very light drilling.

In the forging of many articles, the holes were generally punched. The next drill to supersede this was a drill on a bench for which you fed the power by hand. The next was an

upright drill, which fed the power for drilling.

What a change has been made in this! If the boys nowadays who use the new machines had to use the old ones, they would want to quit work in a twinkling.

Bolts had to be cut with dies and stocks, which you had to run up and down three or four times before you would have anything like a thread on it. The small bolts below five-eighths were nothing, but when you had a lot of bolts from three-quarters to one and a quarter on a hot day, how it would make the cutter puff. Now we have dies that one run-down does the business, and you can cut all the bolts and throw them on the ground, and tap your burr, and any one will fit any bolt. We forged then all the circles and boxes, and made many of the bolts wanted.

I think if all the blacksmiths would follow a rule that my father did, it would be to their interest. We would put an estimate on a job, so much for cash off. On repair work, four per cent. off. If a man didn't pay by the end of six months quit him.

The prices then for shoeing were one dollar a set for calked steel shoes, eighty cents for plain, forty cents for moving. Now the prices are on an average, one

AUSTRALIAN ORNAMENTAL IRON WORK.

dollar and twenty-five cents for calked steel shoes, one dollar for plain, fifty cents for moving. In my shop my son now runs, he gets as high as two and a half for steel shoes, one and a half for plain, and from fifty to one dollar for moving. We used then the old style of

IRON HINGES FOR CHURCH DOORS.

bellows, didn't know what a fan or a blower was.

Artistic Iron Work by an Expert Australian Smith.

R. C. LEONARD.

The accompanying photographs show some specimens I have made of a class of work taken up since I began reading THE AMERICAN BLACKSMITH. I find it one of the best of things in connection with my trade, that of a general smith. It has taught me one of the main points, and that is patience. I also find it most instructive and a good advertisement. The articles which one can make are very useful. The photographs show only a few of the many things I have made in my spare time.

One photograph shows the shop of Brookman & Co., Terang, Victoria, where I did the work, leaving since to travel for experience. Another shows a collection of horseshoes made of aluminum and mounted on handpainted satin, making a very nice lot. One of the tables is made of $\frac{1}{2}$ by $\frac{3}{16}$-inch iron, the bottom parts being all solid and of very pleasing design, though I am afraid the photograph is not any too clear. Standing on the table is a rose, my first attempt. Another and simpler table is also shown, which may give some hints to the beginner. The church door hinges are of my make and may be of interest. The last figure shows a buggy that we build a great many of in this country.

These photographs of my work will undoubtedly be interesting to your many subscribers. I would be pleased to see and hear what other smiths are doing in this line.

Talks to the Jobbing Shop Painter.—16.

Popularity of Natural Wood Finish.—Cleaning and Preparing the Surface. Filling, Varnishing, Stripping.—Washing and Rubbing the Surface. The Various Processes Described in Detail.

M. C. HILLICK.

The carriage finished in the natural wood is a very popular one in both city and country the present season. Such finish possesses a cool, summery look quite irresistible. In the big cities one may see fine and exclusive varieties of timber finished in the highest development of the wood finisher's art converted into vehicles of many styles and kinds. To know how to finish in the natural wood is an important part of the jobbing shop painter's trade education, and a part which he will find it profitable to cultivate, for unquestionably the natural wood finish is destined to increase in favor with road riders the country over.

The first essential in wood finishing is a surface clean, absolutely clean—no finger marks, no stains, no dirt.

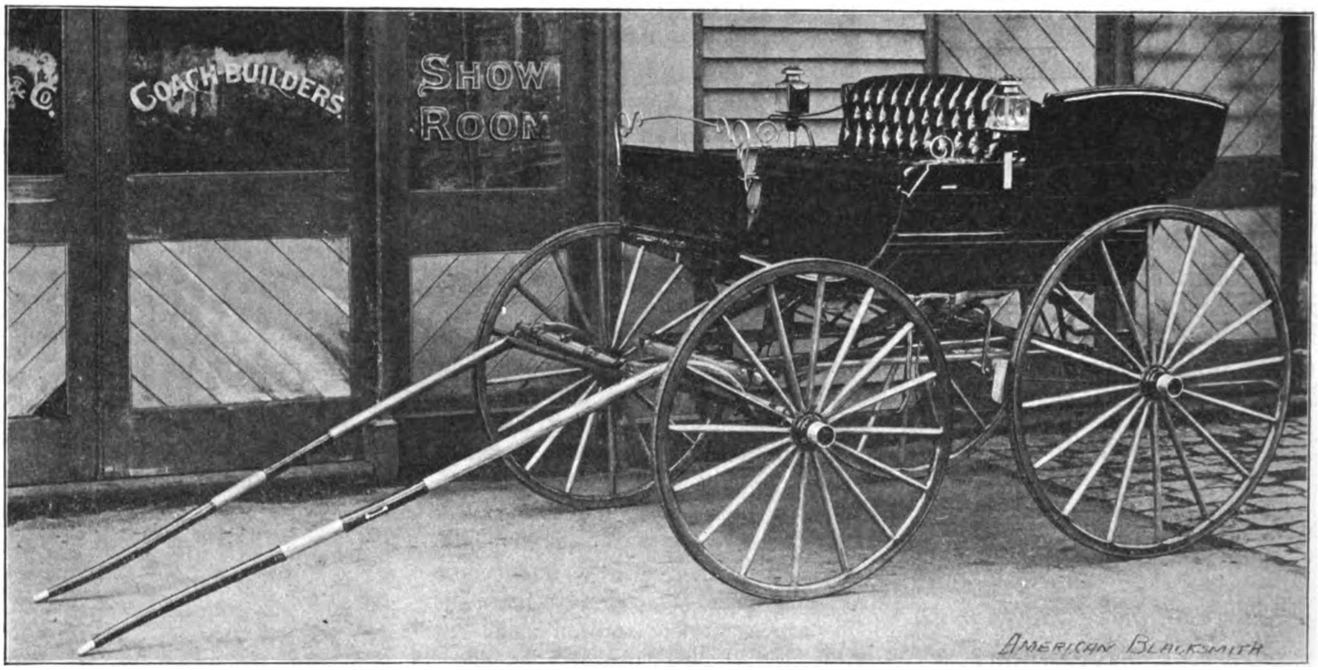
This sort of clean surfacing must

A SIMPLE ARTISTIC TABLE DESIGN.

start before the first coat of filler is applied and made to continue all along through the various processes of finishing. A faultlessly clean surface from start to finish is an admonition that deserves to be emphasized. The second

essential, and by no means less important than the first, is a well filled surface. Many first class painters fail to secure a strictly high class finish in the natural wood by reason of failure to fill the grain of the wood completely. The expert wood finisher will tell you, if he speaks candidly, that filling the wood properly is the main secret—or, if you please, the whole secret—of the natural wood-finishing art. The surface that you often see with the grain fairly standing out above the varnish—bristling like stubble over a harvested grain field—is not due to poor varnish, nor perhaps to poor varnishing, nor to inferior or inadequate rubbing of varnish but rather to an imperfectly filled surface. When the surface is filled so that all the grain of the wood is closed up, and the pores sealed, and the rough places made smooth, and the inequalities of the surface reduced, then the varnishing may be safely proceeded with. When the work comes from the smithshop it will need and should receive a sandpapering that will render the surface thoroughly smooth. Better at this stage to spend an extra 5 hours sandpapering in order to insure a uniformly fine and smooth surface, and a clean one, than consume double this allowance of time and labor later on making good that which was neglected at the beginning. Provide a few mowing machine knives, or some pieces of window glass, or, better still, both, and with these scrape away all greasy or dirty spots which the sand paper fails to remove readily. When the surface has been made clean and white as a hound's tooth, apply the filler coat. It was formerly considered good practice to first apply a coat of oil to the wood, but this has been proved a positive detriment. The oil has a tendency to darken the wood or impart to it a yellowish color which among natural wood connoisseurs is accepted as a mark of inferior workmanship. We would therefore advise against the practice of oiling the wood before filling.

The particular kind of filler to be chosen depends, of course, upon the wood to be filled. If the wood is of a coarse, open fibre, like ash, or oak, or chestnut, or butternut, or woods of similar grain characteristics, a good paste filler is in order. And the best paste filler is that made of silex, and called a mineral paste filler. The old fashioned cornstarch filler has been superseded by mineral fillers purely upon the basis of superiority. The cornstarch filler discolors and shrinks and fails to hold out the finish like the mineral filler, which hardens like adamant, and stays hard for all time, and holds up the finish as long as the body of varnish remains intact. The mineral filler is, or should be, at any rate, perfectly transparent so that the filling is not acccomplished at the expense of the beauty of the wood. All fillers should contain sufficient refined raw linseed oil to act as a binder. And the thinner should be turpentine of an approved quality. Use a good, flat bristle brush with which to apply the filler. In applying be sure that all parts of the surface are thoroughly coated. The ordinary paste filler of good make will set in from 15 to 30 minutes, but as to this the workman must be guided by the appearance of the filler after application. Once the filler begins to change from the wet condition to a dull, dry appearance, it is ready to be wiped or rubbed off, always beginning the work at the point where the filler looks driest. Flax or hemp tow is the best material with which to rub in and off the filler. The tow rubs the filler in, at the same time removing the surplus. If the filler should be rubbed off too soon after application there is danger of rubbing it out of the grain and fibers of the wood.



STYLE OF BUGGY MUCH USED IN AUSTRALIA.

Concerning this feature of the work, the operator must judge for himself, and study to apply no more than can be taken off before it sets too hard. In using mineral paste fillers the workman should take the precaution to stir the material up in the pail frequently. It precipitates rapidly, and when the solids go to the bottom the remaining top portion is practically useless for filling purposes. It will not pay the carriage painter to make his own filler. It may be bought cheaper than the individual consumer can make it, and if obtained of reliable firms it may be depended upon to give first class results.

In case the wood is a close, hard grained, compact textured growth, such as, for example, hickory, birch, maple

or beech, paste filler may be omitted in favor of the liquid wood filler. Many wood finishers, however, prefer to use the paste filler upon the close grained woods, thus making sure of a smooth, satiny finish. To a large extent the workman must be governed by the condition of the wood as he finds it, and use the best filler which that condition suggests.

Having the wood filled properly, and adequate time given it to dry, the next step in the process is to apply rubbing varnish. Select a very pale rubbing varnish, sufficiently elastic to work freely under the brush, and apply a freely flowed on coat. When dry, rub this coat with No. 00 pulverized pumice stone and water, using a perforated rubbing pad of felt, obtainable at the paint supplies store in various thicknesses, the ½ -inch pad being preferred for large flat surfaces, and the ¼-inch thick pad for running parts. Pieces of plush or heavy broadcloth will answer the purpose very nicely. Indeed, not a few expert surfacers prefer plush or broadcloth for the work. Rub the varnish lightly and uniformly, and wash thoroughly clean. Upon this coat, when rubbed, do all striping and ornamental work.

To enhance the cool effect of the natural wood finish stripe in fine lines of 20th century blue, Prussian blue, cobalt or ultramarine blue, or in fine lines of black. The double and three line stripe is popular, the latter being used upon the running parts of the heavier type of carriage. The metal parts of the gear to be painted a light buff, shaded to harmonize with the wood. Dainty lines of red are also popular upon natural wood finished jobs. After striping, flow on a second coat of rubbing varnish. Permit this coat to harden perfectly, and then rub firmly and uniformly. In washing up, tool out all places where the pumice stone is likely to lodge and hold fast, such as around clips, knuckles, bolt heads, etc.—in fact wash absolutely and perfectly clean. Then in clean surroundings finish with a pale finishing varnish, and your work is complete.

(To be continued.)

Buggy Repair Work.

CHALMER PARIS.

The following gives my way of repairing box buggies where the side bars are pulled apart from the seat. There are two vertical pieces of wood fastened on the inside of the sides just at the front and behind under the seat, with a wooden cross-piece screwed at each end to the vertical pieces in front and behind the seat. Almost all the box buggies here in Ohio are fixed this way, and after running a little while they pull apart at those ends where they are screwed to the vertical pieces. That lets the seat frame come apart, the ends dropping down and splitting. To fix it, I take a ¼-inch rod, weld a ¼-inch carriage bolt on one end, bending the head so that it will fit against the sloping sideboard and putting a neat nut on the other end. I then bore holes through the sides close to the horizontal pieces just under the front or back edge of the seat, or both, if necessary. Put the iron rod through, screw up the nut snugly, cut off the end of the rod, dress up with a file and paint over nut and head. It will be stronger and better than ever before, though the method may be old to many. In this oil country buck wagons are used principally, the box buggies not being strong enough.

A Vermont Shop and Its Equipment.

OTIS GEDING & SON.

We have a shop 28 by 40 feet with a lean-to on one side 10 by 22 feet for a bench room. On the ground floor we have a 16-inch cabinet planer, that planes to 5¾ inches thick, Baxter make, Lebanon, N. H.; one heavy bench saw with cut-off table to run in place of guide; one three-headed molding machine, made by J. B. Smith Company, Smithville, N. J.; one buzz planer, 12-inch knives and 6-foot table; one 36-inch band saw, a very heavy iron frame machine that can saw to 11 inches thick; one wood lathe, 5 feet long and 22-inch swing; one Little Giant power drill; one emery stand for gumming saws and grinding tools, mowing machine guards, etc. We also have a sand drum to run in the lathe, 14 by 26 inches, for sanding small work, and a sand belt to sand whiffletrees, rims, etc.

Our shafting is hung in the basement out of the way, the belts coming up through the floor. In the basement we have a grindstone, 4 feet 6 inches by 3 inches wide; one heavy wood lathe, that can swing work 12 feet long and 30 inches in diameter; also one apple grinder and two hand cider presses, with which we can grind fifty bushels of apples in 20 minutes, and press and barrel the cider in about 70 or 80 minutes more. For the cider we get two cents per gallon. We have a windlass outside to raise the barrels of cider into the farmers' wagons, it being mostly custom work. In this room also we barrel cider, store shafts, rims and wheels, framing pins and small work.

About eight feet from the shop proper we have a building 18 by 28 feet, with a basement 18 feet square, which we have used for smith shop, the ground and upper floors being used for storage of lumber, as well as two sheds at the other end of the shop, and a large barn about eight rods further on, where we keep sleds, wagons, cart and wagon bodies, etc. In our smith shop, we have a Western Chief forge, No. 3, (Canedy-Otto Mfg. Co., Chicago Heights, Ill.), which I recently improved by putting a rim of ¼ by 3-inch iron around just inside the flange and fastening it with clips. I also put a partition across my rim about eight inches from the end of hearth for the tools, such as small punches mostly. I then lined up the fire hearth so as to give a fire about three inches deeper than formerly. We thus have a nice fire, plenty heavy enough for welding 3 by ½-inch tires. We have a 125-pound anvil, a Stoddard four-inch upsetter, made by the Fulton Iron Works, Detroit, Mich., and a Derby screw plate, No. 101, that will cut from ¼ to one-inch, made by Butterfield & Co., Derby Line, Vt.

We are about to move our forge and tools to the ground floor where we will have more room and be handier. We would like some ideas about how to plan the shop. The room is 18 by 28 feet, 10 feet high, with 1¼-inch, matched hard wood floor, and we shall only have one fire. Our work in the blacksmith department is ironing sleds, wagons, whiffletrees, wagon and dump bodies, setting tires and axles, mending chains, buggy and sleigh repairing, and every kind of work except horseshoeing. We keep a horse, but our brother smith shoes her.

We charge a fair price for good work, and let them kick. If any weld or piece of timber shows defect when broken, we replace it without grumbling. Have a good deal of bother collecting, but have lost only $19.00 in three years. We do more wood work than iron work, there being two other smith shops, and no other wood shop. We have water power which is ready at any and all times, except for a short time in winter, when we have less power, but nearly always enough to do our work. Our water wheel is 17 inches in diameter, and will plane 5,000 feet of spruce board per day, the head being 16 feet of water. We shall put in a small wheel to run our fan this spring, as we do not run our machinery enough to run a blower all

the time. We tenon our spokes with our drilling machine, and bore our hubs and rims on a power boring machine. We also have a foot-power mortising machine, which we built ourselves.

Our prices are plenty low enough, but not as bad as they might be:

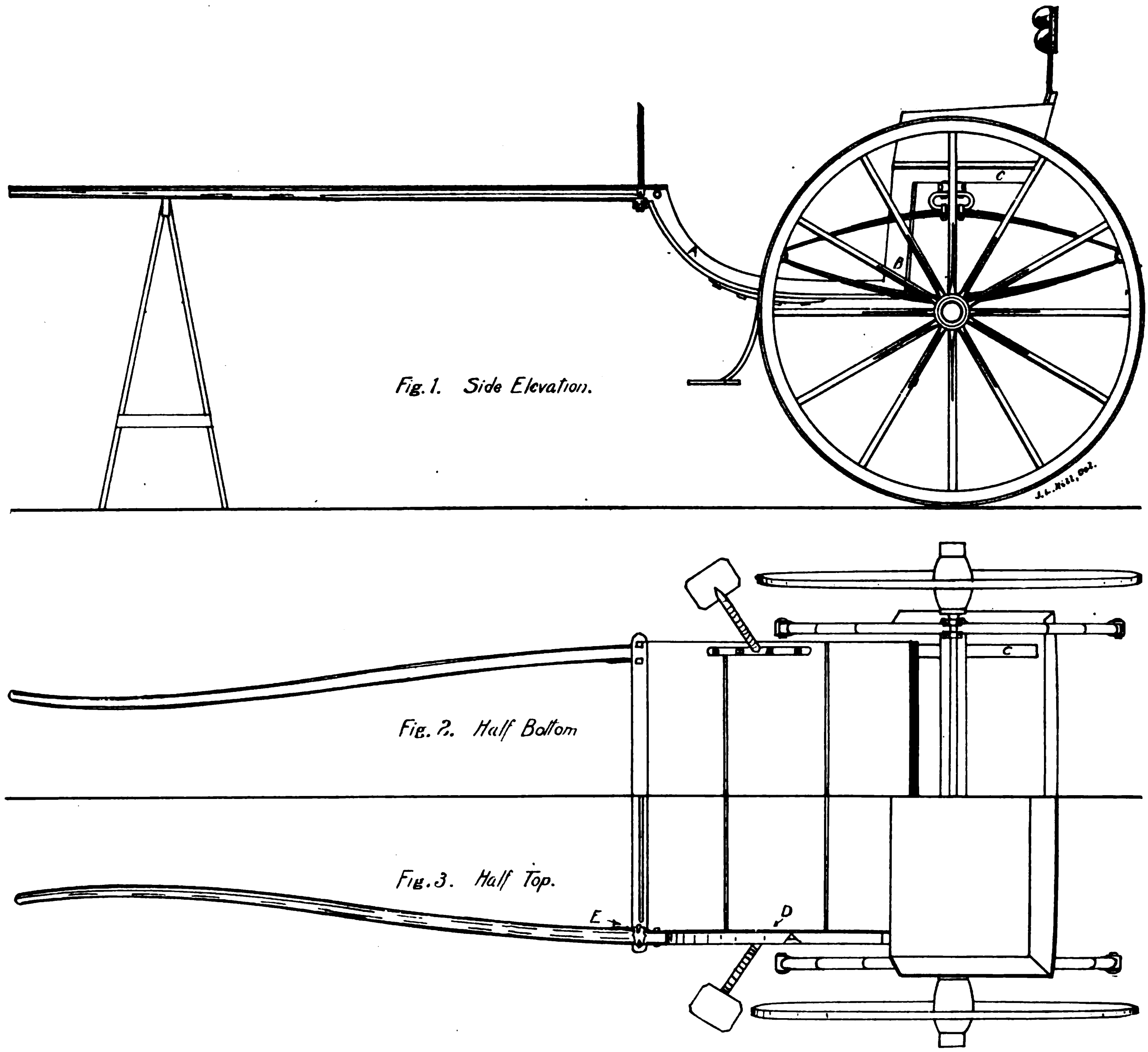
New tires up to one-inch	$1.00
Setting buggy tires, each	.40
Setting tires, per set	1.50
Wagon tires up to two-inches	.40
New rims per wheel	1.00
Buggy shaft	1.25
Sleigh shaft	1.50
Wood hub spokes up to 1½ inches	.16
Patent hubs	.18
Whiffletrees, ironed, per pair	$1.50 to $2.00

Plans for Making a Runabout Cart.

J. LAWRENCE HILL.

This style is of very simple construction, easy to get in and out of, light, and in every way what its name implies, a cart suitable to run about in, but not for heavy work. As can be seen from the illustrations, there is nothing complicated about it; in fact it would be hard to imagine a vehicle more simple. The joints used are the common half-lap; the shafts can easily be sawed out of a 1½-inch plank and the bent piece A is half a rim, one end of which has been straightened out. This rim piece, the end it needs to go just beyond the spring bar.

The bottom boards are screwed underneath the rockers after the plates are on and the heel board is fastened on the back of piece B, as shown, but no boards are necessary across C, as the seat is bolted on to this piece. In the center of bottom boards put an iron strap



Figs. 1, 2 and 3. SIDE, BOTTOM AND TOP VIEWS OF SIMPLE RUNABOUT CART.

upright B and the piece C, going underneath the seat, constitute the rockers, and are each 1½ inches deep by 1¼ inches wide.

On the inside of the rockers, a plate, D, Fig. 3, 1½ x ¼ inch is screwed. One bolt, however, should be used through the heel of shafts, in order to more securely fasten the joint, and keep it so. This plate extends along the inside of shafts for about 6 inches in front of the bar. In the back

about 1x⅛ inch, screw this under front bar, and let it run up (3 or 4 inches) the heel board. Screws will not hold in the bottom boards, so get some inch or inch and a quarter clout nails, and after drilling holes in plate, to fit the nails, drive into bottom, and clinch the nails on the inside, taking care to turn the points of the nails right into the wood.

The loop between top of spring and bar is made from a bit of steel tire 1¼x¼ inch. It is preferable to a block as it is

much neater and lighter looking. The shafts are $2\frac{1}{8}$x$1\frac{1}{2}$ inches at the bar. They are therefore wider than the rim piece A, and this extra width is cut off on a slant as shown in Fig. 3, at E.

Fig. 4 will convey a better idea of the method of making the joints, than pages of explanation. While it illustrates only the front end of bent rocker and heel of shaft, the same thing is applicable for the other two joints.

The perspective drawing shows the appearance of the vehicle to better advantage, and does away with the necessity of a back elevation, as all the widths can be obtained from Figures 2 and 3.

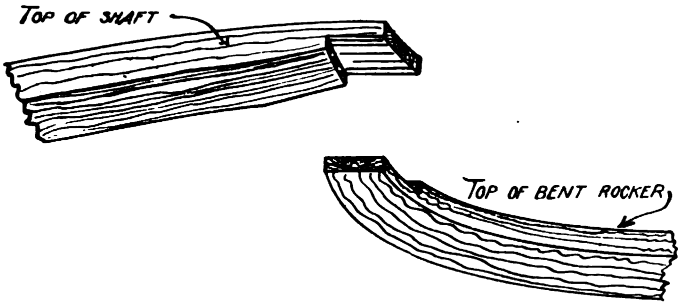


Fig. 4. METHOD OF FORMING JOINTS.

The following dimensions will be found helpful—Wheels: Sarven, 44 inches; spokes, 1 inch; length of hub, $6\frac{3}{4}$ inches; tire 1x$\frac{1}{4}$ inch round edge steel; track, 4 feet center to center; axle, 1 inch half patent; springs, 38x$1\frac{1}{4}$x4x7 inches and 36 inches apart, center to center on the axle; dash, 12x$\frac{1}{2}$x20 inches.

Painting:—Seat, rockers, dash and shafts, black; other parts, medium green, striped with light green.

The above cart would be especially useful to the merchant who has a country trade to call upon.

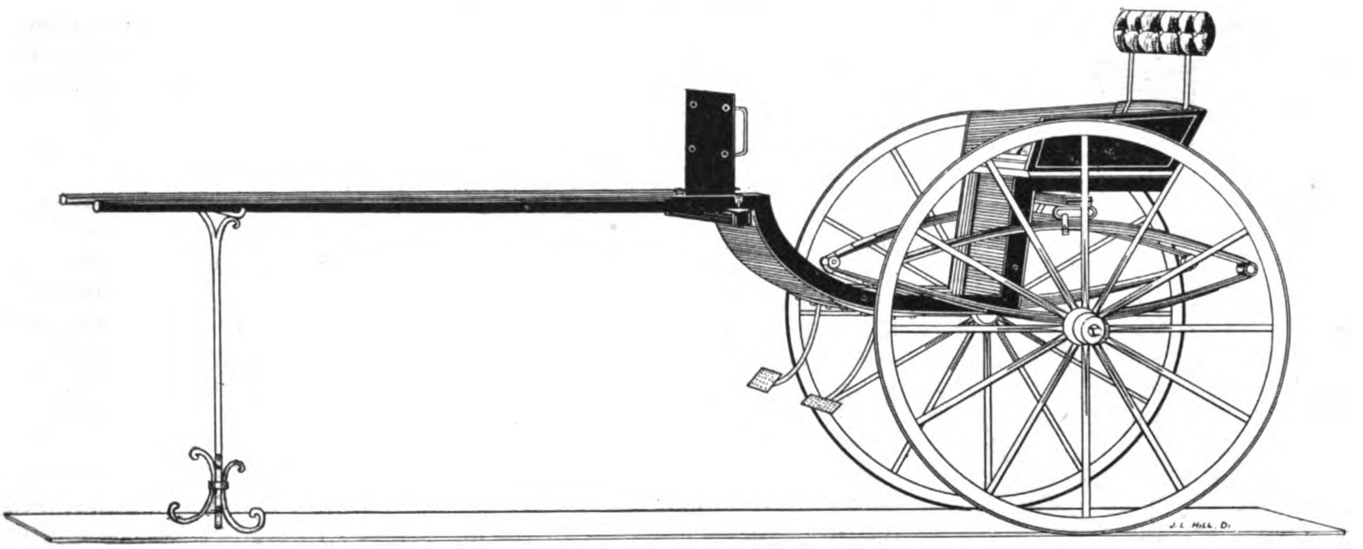


Fig. 5. PERSPECTIVE VIEW OF THE RUNABOUT CART.

It is very simple; one which any smith can make and when made in your spare time, if not to order, and put outside the shop, would sell readily.

Making and Repairing Wheels.

E. W. PARKS.

When repairing old wheels I take the hub and remortise it. If it is out of shape I make a pattern the size of the mortise, and mortise all the same size, using that pattern to make my spokes by. I allow enough, however, on the spokes to drive tight. In that way you can make a good wheel out of an old hub, and you can get the dish right. You can see just how much dish the wheel will have.

I also use a pattern when I make a new wheel. The hubs that I buy here are not mortised right and if you don't remortise them the wheel will have too much dish. In remortising them I use a pattern the length of the spoke. If you will drive a block in the little end of your new hub, bore a $\frac{1}{2}$-inch hole, and screw a $\frac{1}{2}$-inch wood screw across the little end of the hub, and then use a straight edge say $2\frac{1}{2}$ inches wide and as long as your spoke, you can in this way tell how much dish your wheel will have. You can turn the straight edge around as you mortise, and use your pattern also. By doing this, your wheel will be true when you get the spokes in, the rim will fit nice, the boxes will be no trouble to get in, and the wheel will be true.

In putting on rims or felloes, I find that most of the cobbler smiths, as I call them, don't have them open enough, so that when the tire is put on, the wheel is rimbound. I always leave rims open from $\frac{1}{4}$ to $\frac{3}{8}$-inch, and sometimes as much as $\frac{1}{2}$-inch. If the wheel hasn't any dish I leave it open a good ways. In putting on the tire I always give it enough draw, often $\frac{1}{4}$ inch or more in addition to the opening in the rim, depending on the condition of the wheel. A good wheel with tight spokes and well fitting rims doesn't need the tire so tight. Have your hub mortised right, make your spokes right and to fit right, drive them tight, useing good wood, and you will have a wheel that will stand.

Notes on Repair Work for Cheap Jobs.

D. S. CROME.

To repair wagon wheels that need some spokes and new rims, I screw the wheel on my horse and take the nuts off with a rim wrench. This saves a lot of time. Pull the bolts off with a claw-hammer. This also saves time over the old way of knocking them out with a punch. I take the rim off, cut the heads off the rivets, and pull out the bad spokes. I always repair the hind heels first, as the spokes that I take out will do for the front wheels, thus saving my customer ten cents on every spoke. I glue my spokes in the old wheels if there is no grease on the hub, or if so I use ashes from my forge to dry it up. Then I run the tenons on my spokes, and also run the augur on all the old ones so as to have a good job. Be sure to have them long enough to come through the rim. I mark the rim, bore and finish it in the vise and drive it on.

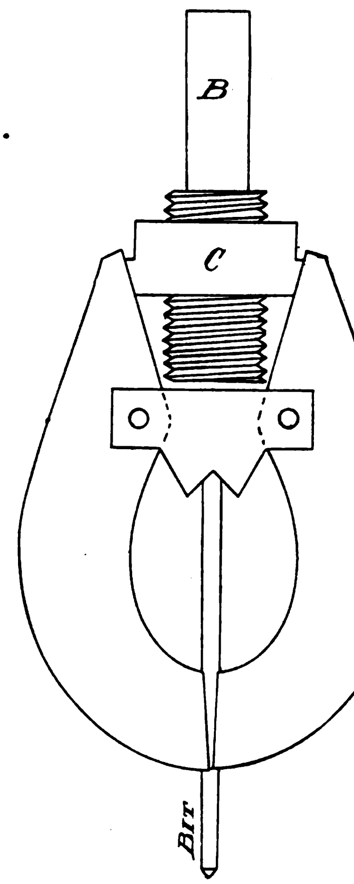
I prime the rim before putting it on. I always paint the rim as I think it

needs it to keep the water out. I put on the tires pretty tight, for it is the tire that keeps the wheel safe. It is also very important to have good rivets to put in the Sarven hubs and to rivet them tight. I use a rivet set when I have only one or two spokes to put in. Cutting them a little long, I often save the work of upsetting the tire.

For a wheel that has gone back, I cut some out of the rim, then get my tire the right size and draw the back of the tire so as to make it tighten on the face, and it will dish the wheel all right.

If the front axle is broken at the king bolt hole and it is too short to weld without putting in a piece, instead of welding in a piece the same size as the axle, as I once did, which I find takes too much time, I put both pieces in the fire, upset and scarf, and at the same time have a piece the width of the axle, half-inch thick, and weld it on the scarf of one axle. This makes a good job and saves time.

For broken shaft irons, I splice lots of shafts, giving them as long a scarf as possible. Glue them, using lots of brads, and rivet them with old tire



HANDY HOME-MADE DRILL CHUCK.

bolts. I think rivets are stronger than screws. Put a new leather on and you have a good job.

Sometimes I have springs to weld. All I can say is to have a good fire and don't heat the steel too hot. When I set up springs I just warm them a little and hammer them up on the anvil. The more a spring is hammered, the better it stays up.

If the shafts on a wagon are bent down, and the customer wants them straightened up, but thinks he can't afford a new pair, I take the shafts apart, wet them, run them through the forge fire until they are hot, put them in a vice and spring them straight, put them together and they are just as good as new. I straighten bent spokes and reaches in the same way

Now we will say that the wagon we have been fixing is ready to be put in shape for the road, so on goes the wheels. If the washers are worn out, I put on new ones, new anti-rattlers, new shaft bolts, paint the rims and spokes as near like the old paint as you can, and touch the nuts on the other wheels, for paint looks better than rust. Have the buggy run without any noise when it leaves the shop, and the customer will feel he has received value for his money.

An old sleigh comes in with a runner broken up on the turn about six inches, and is to have a new one. I take a half rim, wet it and run through the fire, and straighten all but what is needed for the turn. Now scarf, mortise and put it on. This is all right when you are stuck.

A Home-Made Drill Chuck.

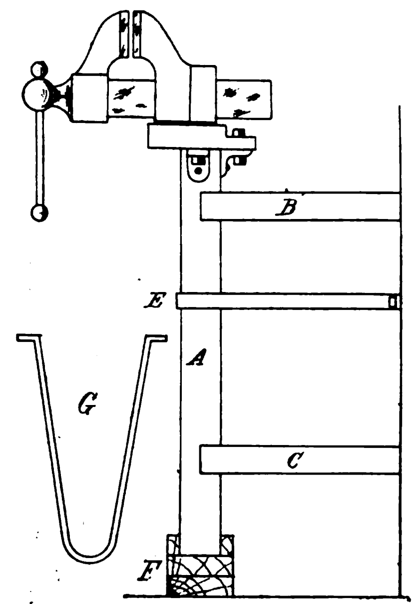
WM. A. DOUGLAS.

The drawing shown herewith is that of a drill chuck which I have been using for two years, and which I find is all right for straight bits. B is the shank forged and turned, and C the nut which spreads the jaws at the back and clamps the bit. The jaws are of steel and groved in end to center the bit. The lower end of shank is centered to let the bit go into the center. I made this tool, and any blacksmith who makes one will find it most useful.

A Convenient Vise Arrangement for Filing.

JOHN W.

Having a great deal of filing to do, I built a vise as follows, the letters referring to the figure herewith. At A is shown a piece of 3-inch pipe, having three angle lugs rivetted to the top with holes to correspond with the holes in the vise. B is the bench, having a half circle cut out of its face to receive the pipe. C is a shelf cut out in the same manner as the bench, and D is a piece of 1¼ by ⅜-inch tire bent as shown at G, and bolted to the wall so that the pipe is free to slide up and down or turn at any angle to get better light. A blow downwards at E fastens the vise in any position or at any height desired, and a slight tap upwards loosens it. F is a block having three different thick-



DEVICE FOR CONVENIENT FILING.

nesses, the middle thickness being the one I ordinarily use for convenience. Ever since finished, my satisfaction with it could not be expressed in words.

A Serviceable Coke Heating Furnace.

W. G. GAMBLE.

The following is a description of a very useful furnace which takes the place of a hollow fire and can be lighted and ready for a heat in fifteen minutes. In my work at the Iroquois Iron Works at Buffalo, I find it a great saving over a hollow fire where there is much machine forging done.

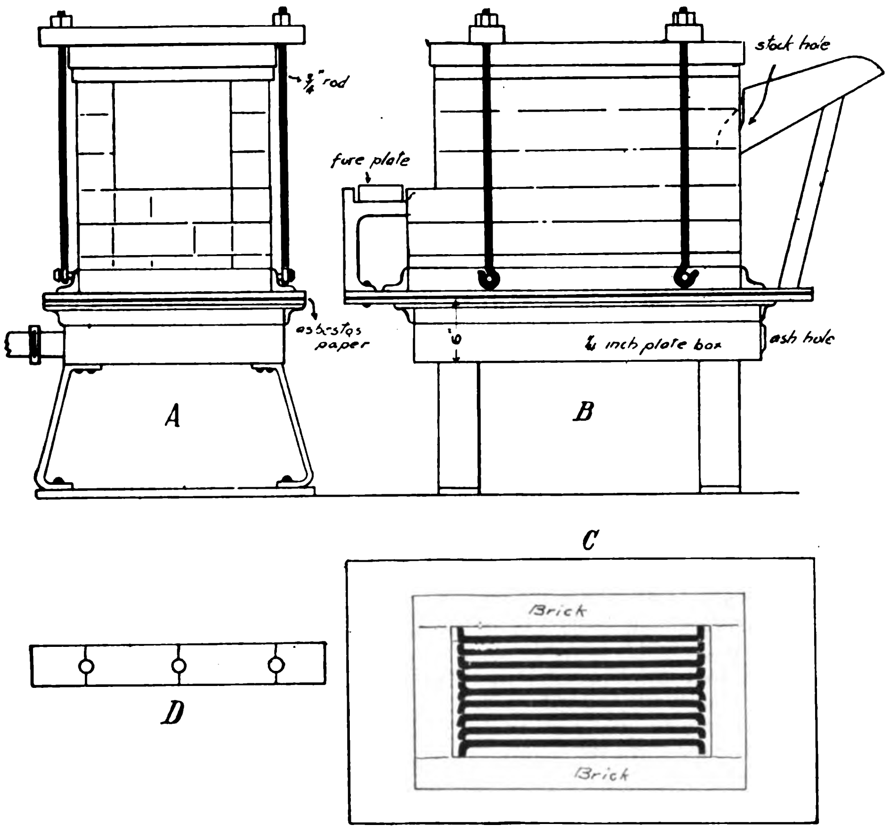
The iron work consists of a box made of ¼-inch plate, rivetted together, with bottom and sides, no top. The grate plate forms the top, between which is ⅛-inch asbestos paper to make the joint air-tight. A 3-inch hole is cut in the side to admit the blast pipe, and a 4 by 6-inch hole in the rear for cleaning out the ashes. The box should be at least 6 inches deep—the legs can be made to suit. Three-inch angles make a good bearing for the joint, which is rivetted all around the top of the box. Then comes the grate plate, which is bolted to top of box. A square hole is cut the width of inside of furnace and 2 inches less than the inside length, which allows an inch at each end for the grate bars. These are bent at the ends to keep them apart to leave the air spaces. They reverse in the center,

as shown, and in our furnace are ⅝-inch square.

Rivetted at the grate plate are four angles, 3 by 3 by ⅜-inch, with allowance for bricks, 9 by 4½ by 2½ inches, to be placed, also allowing one inch on each end for grate bars. There are four ⅞-inch rivets shouldered down and allowed to project one inch out from the angle to their head. This permits the clamp rods to hook on, as shown. The front has brackets for the fore plate, and the rear has hopper for coke. This hopper is filled at all times, choking the blast and superheating the coke. The hopper flares out to hold a good supply, from which the furnace is fed.

The top is made of 9 by 4½ by 2½-inch fire brick, which are notched out as shown and filled with fire clay. A band is shrunk on to hold them together. I happen to have some large brick that cover the whole top, and these work better. I also have a whole brick for the door, but if the forging comes through the door, we use old broken brick to fill up the door space.

To operate this furnace, run a poker with a small hook on the end down and pull up grates, the ashes dropping down in box. Clean out box at slide and fire up. If in a hurry, shovel in hot coke from a side fire, put on blast and the fire will light up what coke is in the bottom. With a poker displace the ashes, put up the door, and with a good blast for ten minutes the furnace is ready to charge. If the furnace is run steadily, it should be cleaned two or three times a day, which takes more time. Care should be taken to have front and back walls separate from the side walls, for they burn out first and have to be renewed.



COKE-HEATING FURNACE. A—END VIEW. B—SIDE ELEVATION. C—GRATE BAR ARRANGEMENT. D—NOTCHED BRICKS FOR TOP.

Axle Repairing and Spring Welding.

JACOB ZIMMERLI.

The most important part of repair work on carriages is the running gear. In stubbing axles, a way that is used a great deal is to make the axle as long as it was before stubbing. This is all right providing the axle has its proper length and gather, but on the whole it is a haphazard way of doing. There is a sure way, however, of making the axle easy running. Before taking the boxes off the stub, make a mark on the stub at the rear end of the box, put your box in wheel when done, and then measure with rule from outside of spoke to rear end of box. There being two wheels, double the amount, and subtract it from the track, and you have the proper length. For instance, take an inch tire, the carriage to run in the center of the wagon tracks, which here in Illinois are very wide, 62 inches. The farm wagons having 1½-inch tires, that would mean a 61½-inch track for carriages. Now say that from the front of spoke at the hub to rear end of box it measures 4 inches.

SPRING FORKED FOR WELDING.

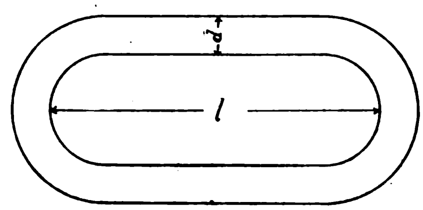
Doubling this, 8 inches, and subtracting from 61½, we get the length from mark to mark, 53½ inches. This rule will give you plumb spokes. Give your axle a little gather, about ⅛ to $\frac{3}{16}$-inch, and you will have an easy running carriage.

Referring to spring welding, of the various methods, rivetting before welding, splitting in half and forking, and ordinary lap welding, I always have the best success by making three splits in the end of each piece, thus dividing the end into three parts or tongues of equal width. See figure. Then bending the two end tongues in one direction and the center tongue the other way on each part of the spring, and then scarfing the two respective sides over the edge of the anvil down to a feather edge, I heat both pieces and shove them tightly together, heading the turned pieces as near as I can to a level. This makes a tight clamp. Then I take a heat with borax or cherry heat compound and weld by striking a quick blow. A spring treated in this manner will last almost as well as a new leaf.

Length of Stock for Chain Links.

S. L. LEE.

The following formula for the length of stock for making links of a chain was given me by an old chain maker, and I have never found it to fail. Referring to the figure, the formula is $2l+5d$, where d is the diameter of the stock. For instance, if we wish to make a link 1½ inches long, inside, out of half-inch stock, cut off 5½ inches—($2 \times 1\frac{1}{2}+5 \times \frac{1}{2}= 5\frac{1}{2}$). This allows for the weld.



CALCULATING CHAIN LINKS.

The above formula will be found very useful and time-saving, and much better than the "hit or miss" method.

Would be pleased to hear of any other formula or method used by brother smiths in measuring stock for chain links.

A Lay of the R. F D.

There's heaps of changes come, of late,
around ol' Nasby's Station;
Pears like they try to keep up with the
balance of the nation.
They've laid these ce-ment sidewalks down
acrost the ol' hog-wallers,
An' trolley-cars go zippin' up the hills an'
down the hollers.
The town pump's took out long ago, an',
through the young folks naggin',
They've shet the ol' postoffis up an' put it
in a waggin.

The other things wuz bad enough—the
patent mower's rattle,
An' all this gol-blamed barbled wire, a
cuttin' up the cattle;
The hitch-rack gone, an' in its place a
"public feedin stable;"
But us ol' chaps could stand it all, as long
as we wuz able
To yarn, while waitin' fer the mail—it kep'
the time from draggin';
But now they've took the offis out an' put
it in a waggin!

I tell you, there wuz sollum looks when we
heard it wuz comin';
It kinder seemed as ef it stopped the very
bees from hummin'.
The youngsters an the wimmen-folks, they
laffed at our "fool notion,"
An' 'lowed we's "cloggin' pro-gress" with
our "fogyish commotion."
But us—we knowed, without them times,
the days 'ud go a laggin'
With that ol' postoffis shet up an' put into
a waggin!

Why, how on airth kin we keep track of one
another's capers,
Er hear all of the gossip that ain't in the
city papers?
'Bout all the fun us ol' uns had wuz getherin
round at Nas's,
An' swoppin' lies—pertendin' that we'd
come fer soap er 'lasses.
I vum, I've squatted 'round down there till
both my knees wuz baggin',
But now they've took the offis out an' put
it in a waggin.

I reckon that the good ol' times is gone fer
good an' ever,
An' I wisht I'd went with 'em, fer I can't
git used—no, never—
To all these blame contraptions that the
new times is a bringin'—
Th' tellyphone, an' tellygraft, an' trolley-
wires a singin'.
But uv all these, the thing that at my very
heart's a-draggin'
Wuz when they closed the postoffis an' put
it in a waggin!

—*Frank Glover Heaton.*

HEATS SPARKS WELDS

Midsummer, with its long, hot, dry days.

Half the lumber cut in America is produced in the Southern States.

Strange to say, the men who cry loudest against price cutting are usually the first to resort to it.

Cold Tire Setting.—What has been your experience with machines for doing this? Send it in.

When a man you have a bill against takes his work to another shop, it's time to look sharp to collection.

From the top no hill seems half as high as it looks from the bottom. Obstacles dwindle in the effort to overcome them.

Don't run down your competitor. Run up your own reputation by doing better work and his will suffer by comparison.

"Nawthin," was Tom Tardy's reply when we asked him how much money he had spent in the past year on papers, books and trade journals.

"I make everything that comes along," says one smith. Incidently, he makes money, though not all smiths can turn their hand to everything.

The census of 1900 shows the center of population of the United States to be about 20 miles east of Columbus, Ind. In 1790 it was 23 miles east of Baltimore, Md.

Ship smithing and gun smithing are two topics of more or less general interest to the craft. Who can put us in touch with practical men to write upon these subjects?

Some smiths send out statements of account only once or twice yearly. No business man would think of letting so much time elapse, and the blacksmith must be something of a business man to win out.

It pays from a pocket book standpoint as well as from a humane one; to guard against injuries to employees. Failure to properly safeguard life and limb may render the employer liable in case of an accident in the shop.

It has been proved beyond a doubt that shop employees do more work and better work on bright, sunny, days than on cloudy, rainy ones. Take the hint, and make the shop as neat, bright and congenial as possible.

It would be interesting to figure out whether American workmen do not lose more money by strikes than they gain. The industrial wealth of the country suffers much in such unproductive spells. Is the laborer a gainer in the end?

Do you keep your catalogues on file? It pays to have them handy for reference. It is also a good plan to bind your trade journals, year by year, with the index, so that different subjects may be quickly looked up by referring to the index.

Interesting items relating to blacksmiths and blacksmithing are always gladly received for publication in these columns. Blacksmiths who are out of the ordinary, who have made anything unique, who have done something interesting—let us hear about them.

To prevent rust, dissolve one ounce of camphor in one pound of melted lard. Remove the scum. Mix as much black lead with the lard and camphor as will give it an iron color. Clean the machinery well; smear with the mixture. After twenty-four hours rub off. Clean and polish with soft cloth.

Rubber tire work is paying a great many smiths handsomely. It is an interesting line and one that any smith can take care of. A number of excellent tiring machines are now on the market at moderate cost. In such matters as these it pays to be the pioneer, the first one in the neighborhood to take it up.

A neat advertisement for the smith shop consists in a nicely printed business card, stating the kind of work the owner is prepared to do, on the face, and on the back giving the distances in miles by road between fifteen or twenty of the surrounding towns and villages. It is a business card that will be kept by the man who gets it.

Timid as a bird are some smiths when it comes to joining an organization with their fellow craftsmen for regulating prices, They will vow and declare 'tis a good thing, deserving every man's support and efforts, but the minute they are asked to do something definite about joining, up in the air and away they go. Afraid to make a move till their neighbors come in.

The card system is a splendid way of keeping track of running accounts. On a small card may be put the name, the date of each job, the charges, the payments, everything, in fact. It may be easily kept to show the state of the account at any time, and how payments are being made. It is easily filed and easily discharged when the account is dead.

Many, many thousand of dollars annually are wasted in the coal which pours in the shape of smoke from the innumerable chimneys of the land. Many minds have worked on the problem of securing the complete combustion of coal, thus to eliminate the waste and promote cleanliness, and the day of smoking chimneys is undoubtedly drawing to a close.

Bronzing cast iron.—Having thoroughly cleansed the surface and rubbed it down smooth, apply evenly a coat of vegetable oil, say, sweet or olive oil, and heat the iron object, being careful that the temperature does not rise high enough to burn the oil. At the moment of decomposition of the oil the cast iron will absorb oxygen, and this forms upon the surface a brown oxide skim or film, which takes a fast hold and is so hard that it will admit of a high polish, thus bestowing upon the iron a most striking resemblance to bronze.—*Ex.*

An age of wonders is this surely. It is now proposed to print daily papers on shipboard containing the current news of each day. Heretofore ocean voyages were practically without news of the world's happenings from leaving one port till reaching the other. Lately, by the use of wireless telegraphy, it has been possible for trans-Atlantic steamships to keep in communication with one shore or the other the whole way across, and this fact makes possible the publishing of daily newspapers aship board. Arrangements are being made with the Associated Press for supplying the news matter and with the Marconi Company for transmitting it.

At the age of twenty John W. Lounsbury came to Port Chester, N. Y., learned the blacksmith trade, and soon owned a shop. In 1851 he opened a grocery store, which he conducted up to his death, a few weeks ago. From his early craft of blacksmithing he rose to be one of the wealthiest and best-known bankers in his county. He was a very plain man in dress and manner. He never would give up his grocery store, and after he became a rich man he could be seen behind the counter in his shirt sleeves weighing out sugar for customers. He had a hobby, also, for dropping into the village blacksmith shops and swinging the sledge, because it reminded him of olden times when he, too, worked at the anvil.

American Association of Blacksmiths and Horseshoers.

The far-reaching importance of the question of organization for blacksmiths, horseshoers and wagon builders is shown by the many requests received for our plans for organizing local county associations. These plans set forth the best way of starting such a movement and are furnished free of cost to anyone of the craft upon application to the above Association, Postoffice Box 974, Buffalo, N. Y. This association was formed to aid smiths in bettering their condition and in attaining a greater return from their labor. Specifically stated, its chief objects are to bring about a better scale of prices for smith-shop work, to secure State lien laws that will enable the craftsman to collect his pay more promptly and surely by liens upon horses or vehicles, and to overcome as far as possible the evils of price cutting and incompetent workmen. Anyone of the craft can make the effort to start things going in his locality, and *now* is the time. We should like to see an association of smiths for mutual benefit in each and every county of the land, and shall be glad to give whatever aid and advice we can to this end. Those who are interested should write at once.

The Progressive Smith as a Business Man.—9.

Contracts—The Hire of Smith-shop Help.

BILLY BUNTZ.

Profit being the object for which business is conducted, the progressive smith considers that he himself can do only a restricted amount of work when laboring alone; hence he seeks means for increasing his custom so he can employ help and thereby make a profit off the hands of others. Knowing that applicants for a job are as varied as they could possibly be, he talks with them as shrewdly as he does with customers.

"Needing any help?"

"Why, how did you know I was needing a man?" he answers, feeling that every one who has worked in a smith-shop ought to know a few "kinks" and that by "drawing him out" he may learn something, whether he hires him or not. He may have had a varied experience in up-to-date shops or worked for a competitor. The average workman is quite willing to tell what he knows when he thinks there is a job in sight, whereas were he bluffed by the usual "No, I don't want anybody!" he would be unlikely to impart any information. Sometimes even an insignificant-looking applicant can give some good pointers by the smith asking him questions about work or machines he himself does not very well understand; or he may be a machinist, boiler-maker or foundryman and be able to tell him how he could make money by enlarging his shop so as to handle work auxiliary to smithing.

"Where did you work last?" he continues, eying the applicant and noting his general appearance and deciding whether he looks like a drinking man; while from his actions and talk he judges whether he is honest, boastful or "talking through his hat."

"Ever have experience on plow work?" It may be that he has had, and relates at length that he can do this, that or the other thing to perfection.

"What's your idea about salary?" Usually he has some weighty ideas on the subject and states he thinks his services worth a good, round sum, the same as with a property owner who looks for a buyer at a fancy price.

Having questioned him thoroughly, perhaps asked him how he handles different work, sets a machine or operates a gas engine, he forms an opinion as to whether he would be a good man for his particular shop, or only an ordinary workman, rather slow and somewhat bull-headed. The woods are full of half-fledged workmen. The progressive smith looks for an assistant from whom he can *learn* something and who can *think for himself*, as well as perform a fair day's labor; in other words, he wants a man with progressive qualifications, who is something of a manager and can handle at least certain kinds of jobs without supervision. The assistant who must be stood over to see that he does things right or who has not good ideas about laying out a job is hardly more valuable than a laborer, although he is apt to think he is worth as much as a first-class workman.

Before making a contract, the shrewd smith wants to see what kind of a workman his assistant will prove under test; therefore at the start he has only a verbal understanding with him, and may treat him thus:

"Just now I need some one to help me a bit—just an ordinary workman—and could take you in 'out of the cold,' may be give you steady work if business continues good, but I couldn't pay much at the start. Of course, if you were able to help me get more custom by handling folk nicely so as to increase trade, I might be able to do better by you later on. You see I have a nice shop to work in, would treat you right, and if you can help me get up a big trade I could pay more."

He watches a new assistant closely, notices whether he has any new ways of handling work, or is ingenious in overcoming obstacles or possesses ability. It may be that he is not extraordinary, and after a time gets into a rut or does little thinking, when it is simply a matter of whether he is sufficiently good as an assistant to continue in his

(No. 1)

This Agreement, *made this* .... *day of* .... 1904, *by and between* .... *a master blacksmith, doing business in* ...., *County* ...., *State* ...., *party of the first part, and* ...., *of same place, party of the second part;*

WITNESSETH: *That the said party of the first part agrees to hire said party of second part as a Blacksmith or "Handy Man" in his smith shop for a period of one fiscal year, beginning with the date of this agreement, and to pay him at the rate of* .... *dollars for each day of ten hours by him worked; part time or over-time to be paid pro rata, but in the event of said second party being sick, injured or off duty for any cause whatsoever, then no pay to be allowed him for the time not actually worked. Said first party further agrees that should second party remain at work during the entire fiscal year he will pay him* .... *dollars additional at the expiration of said period as a free gift or bonus in consideration of his faithful service; an absence from duty of a total number of days or half days amounting to thirty ten-hour work days not to count or annul the payment of said bonus, but should second party remain longer away from work for any cause whatever, then* .... *dollars to be deducted from the bonus for each working day absent over the thirty-day limit.*

Said second party hereby agrees to the above mentioned salary and conditions, and agrees to work under them faithfully for said first party during the period aforesaid. Said second party further agrees to release first party from all responsibility or any suit for damages for, or on account of any injury or accident which might occur to, or befall him while working for first party.

IN WITNESS WHEREOF, *said first and second parties hereto have signed and sealed this agreement on the day and year first above written.*

.... [SEAL]

.... [SEAL]

WITNESSES:

....

....

employ. It might be that another assistant, with different ideas, could do the work as well, which would allow the smith to extend his own knowledge; hence he tells his former assistant he believes he can do better elsewhere than he will be able to do for him, as business is dull or his year is about up; or he may "shove" him on to a competitor by praising him up to the competitor's friends. The shrewd smith never allows an assistant to get the inside track of his business, showing him that it is his business to do what he is told to do, while the smith runs the shop himself; therefore, when an assistant leaves his service, although he may know something of the routine of his shop, he has only a vague idea of how much money was made or of how the smith got some of his trade.

Where his assistant proves to be an excellent workman, as well as a good manager, with progressive qualifications, he knows it would be wise to retain him; therefore he makes a contract with him to prevent his leaving. However, he does so in an offhand way, or without seeming anxious, as he knows were a good workman told that his services were indispensable he would immediately demand a dollar or two more a day; rather, he is particular to point out little mistakes from time to time, so as to show him that he is not altogether perfect. Where a workman is praised highly he is apt to think he ought to have the biggest chunk of the profit.

Sample contract No. 1 contains a few points, its principal provision being that the assistant is induced to remain in the smith's employ a full year in order to obtain the bonus, or increase in pay, at the end of which time another contract may be made.

Sample contract No. 2 relates to the hire of a boy or an apprentice, where the smith teaches him the smithing trade for a term of years and retains a certain amount from his wages to be paid to him at the completion of his apprenticeship, when he may make Contract No. 1 with him. In many States the employment of boys under a certain age—usually under 14 years—is prohibited.

A contract with a minor is termed "voidable" in law, which means that, generally speaking, the minor may reject or accept its terms at his pleasure, as the law considers he has not mature judgment until he is 21 years old; hence the smith has the boy's parents sign with him, in order to make the contract binding.

As a rule, a boy entering upon a trade does not know whether he will like it well enough to serve a full term, nor does the smith at first know whether he will prove to be a willing worker, as some boys do not like to obey orders, feeling that they are being "bossed." Consequently, to avoid the nuisance of having to put up with a boy who is aristocratic, sullen, or unwilling to follow instructions, the smith first gives him a thorough trial before making a contract with him, the same as he would any assistant.

It does not matter much whether the boy's parents are poor or well-to-do, so long as the boy himself is able-bodied, bright, quick, and with a liking for smithing. Some boys are slow acting, "dumpy," "pokey" or unreliable, and apt to take but little interest in their work, or have to be told each time where a tool is, or "fall over it," before they can see it. A good, earnest-working boy should be given lots of encouragement, else he may become discouraged at times when he has worked hard or has made a mistake. Never should he be severely censured about his work, as it should be remembered above all that he has not "an old head" on his frail shoulders. It is a good plan to let him off duty a half day now and then under pay, especially when there is something going on, as a circus, a ball game, picnic, etc., rather than to keep him closely confined in the shop at all times.

It is best to teach a boy only one thing at a time, showing him just how it is done, and then watching and correcting him while he performs the same work. A willing boy so taught will surprise most smiths in a few months by his aptness. In the contract the smith simply agrees to teach him the work as performed in his shop. He does not usually teach him anything about the business end of the work, except possibly as to how certain customers should be treated.

Where the smith has a large custom, he may have three or four apprentices, each on different classes of work, as, for instance, one in his first year, who keeps the shop clean, picks up the tools and keeps them in place or hands them to the smith as he needs them, runs errands, does collecting, etc.; one in his

(No. 2)

This Agreement, *made this......day of......, 1904, by and between................, a blacksmith, party of the first part, and................,a minor, sixteen years of age the 5th of June, 1904, party of the second part, and................., his father, and................, his mother, parties of the third part,* all resident in the Town of.........., County of........, State of............;*

Witnesseth: *That the said party of the first part hereby agrees to teach the party of the second part the trade of blacksmith according to the way blacksmithing is performed in his shop, and insofar as second party is capable of learning it, the term of service to be three years, dating from the execution of this agreement, and further agrees to pay him under the following schedule for his services in the shop, it being understood that ten hours is to constitute a day's work, and that part time or over-time is to be paid pro rata, but that in the event of second party being off duty for any cause whatsoever, then no time to be allowed him for the time not actually worked:*

For the first year, ...cents per day.
For the second year, ...cents per day.
For the third year, ...cents per day.

Said first party further agrees that should second party remain at work during the entire three-year term of his apprenticeship, he will pay him........dollars additional at the expiration of said term, as a free gift or bonus; an absence from duty of a total number of days or half-days amounting to thirty ten-hour work days not to count or annul the payment of said bonus, but should second party remain longer away from work for any cause whatever, then .... dollars to be deducted from the bonus for each working day absent over the thirty-day limit.

Said party of the second part agrees to work for first party, and hereby accepts and agrees to the above mentioned salary and conditions, and also releases party of first part from all responsibility or any suit for damages for, or on account of any injury or accident which might occur to, or befall him while working for first party.

The parties of the third part assent to second party working for first party under the conditions herein contained, and hereby release, and indemnify said first party from, and against, all responsibility or and suit for damages (etc.). Third parties hereby authorize first party to pay to second party all wages as same become due him, including the bonus (if any), without recourse.

In Witness Whereof, *said first and second parties hereunto have signed and sealed this agreement on the day and year first above written.*

....................[SEAL]
....................[SEAL]
....................[SEAL]
....................[SEAL]

WITNESSES:

....
....

(** Or guardian, in case second party is an orphan*).

second year, who does sharpening or drilling; another in his third year, who handles general work, etc. In this way the older apprentices can be used in instructing the younger ones. An expert smith or one who is well established or has a well-equipped shop, should not pay his apprentices high wages, as he is teaching them a trade on which he himself spent much money and time in order to reach perfection—a trade which may later establish his apprentices in business.

Oftentimes a mutual agreement between a smith and his assistant or apprentice forms a bond of friendship which results in a closer relationship, as an energetic, thrifty assistant who is at the same time an excellent workman, is likely to make an honest, progressive partner where he and his master join hands.

A word about personal injuries: Every master smith should exert himself in keeping his machines well-protected by casings, shields, etc., as an open gearing has amputated many a finger, while unprotected belts might wrench off an arm. It is hardly necessary to say that no matter what kind of contract a smith might have with an employe, he could likely be held liable for damages should an accident occur through his negligence or gross carelessness. Emery wheels should have shields, else the operator should wear goggles when doing heavy grinding. Hammer heads should be kept tight in the handles. The supply tank of a gasoline engine should never be filled when there is a blaze or artificial light around. In fact, precautionary measures not only protect employes but enable the smith himself to avoid injury.

The next number of THE AMERICAN BLACKSMITH will contain an article interesting not only to assistants or apprentices who have become full-fledged, but particularly to smiths who are renters, entitled "How to Accumulate or Procure Money to Buy a Smithshop;" to be followed by a companion article citing "How a Smithshop Should be Bought." These articles will give any smith pointers on how to reach the goal of independence.

(To be continued.)

A Treatise on Horseshoeing.—6.

JOHN W. ADAMS, V. M. D.

Special Peculiarities of the Chief Classes of Shoes.

A shoe for a regular hoof (Figs.7 and 8) fits when its outer border follows the walls closely in the region of nail holes and from the last nail to the end of the branch gradually projects beyond the surface of the wall to an eighth of an inch and extends back of the buttresses an amount equal to the thickness of the shoe. The shoe must be straight, firm, airtight, its nail holes directly over the white line, and its branches far enough from the branches of the frogs to permit the passage of a foot pick. Branches of the shoe must be of equal length.

In fitting a shoe to a hoof of regular form we follow the form of the hoof, but in base-wide and base-narrow hoofs, which are of irregular form, we must pay attention not only to the form of the hoof, but also to the direction of the pasterns and the consequent distribution of weight in the hoof, because where the most weight falls the surface of support of the foot must be widened, and where the least weight falls (opposite side of the hoof) the surface of support should be narrowed. In this way the improper distribution of weight within the hoof is evenly distributed over the surface of support.

A shoe for a base-wide hoof.—This shoe should be fitted full on the inner side of the foot and fitted close on the outer side, because the inner side bears the most weight. The nails in the outer branch are placed well back, but in the inner branch are crowded forward toward the toe.

A shoe for a base-narrow hoof.—This shoe should be just the reverse of the preceding. The outer branch should be somewhat longer than the inner.

A shoe for an acute-angled hoof.—This shoe should be long in the branches, because most of the weight falls in the posterior half of the foot. The support in front should be diminished either by turning the shoe up at the toe or by beveling it under the toe (fig. 5a). p. 177.

A shoe for a slumpy hoof.—This shoe should be short in the branches, and for pronounced cases should increase the support of the toe, where the most of the weight falls, by being beveled downward and forward.

In many cases, especially in the hoofs of draft horses that stand very close together, the coronet of the outer quarter is found to stand out beyond the lower border of the quarter. In such cases the outer branch of the shoe from the last nail back must be fitted so full that an imaginary perpendicular dropped from the coronet will just meet the outer border of the shoe. The inner branch, on the other hand, must be fitted as "close" as possible. The principal thought should be to set the new shoe farther toward the more strongly worn side. Such a practice will render unnecessary the widespread and popular fad of giving the outer quarter and heel calk of hind shoes an extreme outward bend. Care should be taken, however, that in fitting the shoe "full" at the quarter the bearing surface of the hoof of the quarter be not left unsupported or incompletely covered, to be pinched and squeezed inward against the frog. This will be obviated by making the outer branch of the shoe sufficiently wide and punching it so coarse that the nails will fall upon the white line.

Hot Fitting.

Few farriers have either the time or the skill necessary to so adjust a cold

FIG. 7.—Left fore hoof of regular form, shod with a plain "fullered" shoe. Note the distribution of the nails, length of the fuller (crease), and the closeness of the ends of the shoe to the branches of the frog.

shoe to the hoof that it will fit, as we say, "air-tight." Though the opponents of hot fitting draw a lurid picture of the direful consequences of applying a hot shoe to the hoof, it is only the abuse of the practice that is to be condemned. If a heavy shoe at a yellow heat be held tightly pressed against a hoof which has been pared too thin, till it embeds itself, serious damage may be done, but a shoe at a dark heat may be pressed against a properly dressed hoof long enough to scorch and thus indicate to the farrier the portions of horn that should be lowered, without appreciable injury to the hoof, and to the ultimate benefit of the animal.

The horse owner should insist on the nails being driven low. They should

pierce the wall not above an inch and five-eighths above the shoe. A nail penetrating the white line and emerging low on the wall destroys the least possible amount of horn, has a wide and strong clinch, rather than a narrow one, which would be formed near the point of the nail, and furthermore has the strongest possible hold on the wall, because its clinch is pulling more nearly

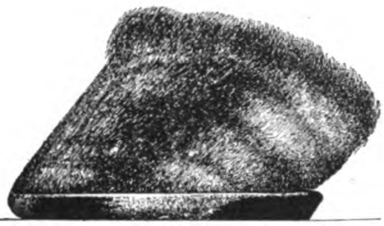


FIG. 8.—Side view of hoof and shoe shown in fig. 7. Note the straight toe, weak ring formation running parallel to the coronet, clinches low down and on a level, length of the shoe, and the under-bevel at the toe and heel.

at a right angle to the grain (horn tubes) of the wall than if driven high. Finally, do not allow the rasp to touch the wall above the clinches.

The Bar Shoe.

The bar shoe (fig. 9) has a variety of uses. It enables us to give the frog pressure, to restore it to its original state of activity and development when by reason of disuse it has become atrophied. It gives the hoof an increased surface of support and enables us to relieve one or both quarters of undue pressure that may have induced inflammation and soreness. The bar of the shoe should equal the average width of the remain-

FIG. 9.—An acute angled left fore hoof shod with a bar shoe. Note the width and position of the bar and the fact that the nails are placed well toward the toe, so as not to interfere with the expansion of the quarters.

der of the shoe and should press but lightly on the branches of the frog. The addition of a leather sole with tar and oakum sole-packing allows us to distribute the weight of the body over the entire ground surface of the hoof.

The Rubber Pad.

Various forms of rubber pads, rubber shoes, rope shoes, fiber shoes, and other contrivances to diminish shock and prevent slipping on the hard and slippery pavements of our large cities are in use in different parts of the world. In Germany the rope shoe (a malleable-iron shoe with a groove in its ground surface in which lies a piece of tarred rope) is extensively used with most gratifying results. It is cheap, durable, easily applied, and effective.

In the large cities of England and the United States rubber pads are extensively used. They are rather expensive, but are quite efficient in preventing slipping on polished and gummy pavements, though not so effective on ice. Figure 11 is an illustration of one of the best of many rubber pads. The rubber is stitched and cemented to a leather sole and is secured by the nails of a three-quarter shoe. Such a pad will usually last as long as two shoes. They may be used continuously, not only without injury to the hoof, but to its great benefit. The belief, unsupported by evidence, that rubber pads "draw the feet" keeps many from using them. A human foot encased in a rubber boot may eventually be blistered by the sweat poured upon the surface of the skin and held there by the impervious rubber till decomposition takes place with the formation of irritating fatty acids; but there is no basis for an analogy in the hoof of a horse.

(To be continued.)

The Practical Scientific Treatment of Interfering Horses.—7.

B. W. PERRIN.

Scalping.

Scalping is a phase of interfering peculiar to runners; it is done at a gallop, at a high rate of speed. The hind feet pass the front legs, while the front feet pass the hind ones, and when the edge of a shoe strikes a leg in passing it strips off the hair and often the skin, which is called scalping. Some horses scalp the hooks with the front feet, while others hit the side of the cannon bone or knee with the hind feet.

The causes may be that the animal is out of condition, not in perfect training, or has too heavy a rider, or else has hoofs that are too long or wide. In this connection I wish to call attention to the fact that in a natural state, the unshod hoof coming in contact with the ground, all surplus growth wears away and extra width chips off, but when protected by the shoe, the hoof often grows abnormally wide.

As to treatment; from the shoer's point of view, the best he can do is to level the hoofs, and then use a light rimmed steel shoe with the rim turned to the inside. See Fig. 16. Reduce all surplus growth of hoof and fit the plates very close; the remainder of the treatment is with the trainer, who must see that the horse is rigged up in suitable boots that protect the parts he strikes, without adding unnecessary trappings that would tend to lessen his speed.

Speedy Cutting.

Speedy cutting, as its name implies, is a phase of interfering peculiar to fast

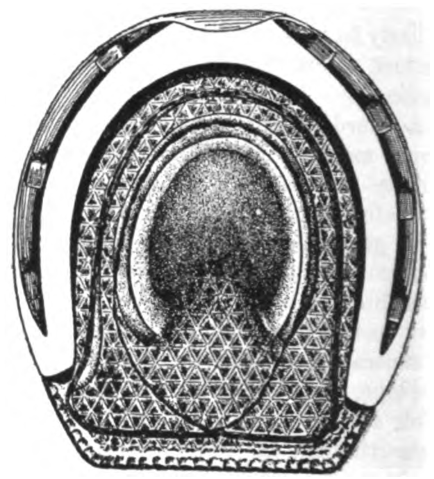


FIG. 11.—Left fore foot of regular form shod with a rubber pad and "three-quarter" shoe. (Ground surface.)

horses. It is done in the act of the front feet passing the hind legs, or by the hind feet in passing the front legs, in the long stride of the passing gaited trotter. There are but few horses that speedy cut, except those that do track work, and whenever it is known that a horse is prone to speedy cut, he should be properly booted, so as to protect the part he strikes, which will vary in different horses. Some horses strike the shin, coronet or pastern of a hind leg with the toe of a front foot. Some strike the cannon bone, knee or fetlock of a front leg with the toe of a hind one.

The causes of speedy cutting are defective conformation of the limbs, improper shoes, unlevel hoofs and inexperience or want of discretion of the driver or rider.

The safest way to obtain the proper level of the hoofs, is to use the horse without the shoes until he has worn the hoofs to the shape that suits him best. Then shoe with light rimmed steel, which can be obtained from hardware houses that handle horseshoers' supplies.

In making these shoes for a speedy cutter, however, turn the rim to the inside of the shoe, round the outside of the shoe by hot rasping, and then fit close. If you cannot obtain the rimmed steel then shoe with half round steel, as light as is practicable for the work. Any horse known to speedy cut should not be put to speed unless he is rigged up in properly fitting boots that will protect him from injury.

Over-Reaching.

Over-reaching is a phrase of interfering peculiar to fast horses, especially saddlers, but it may occasionally happen to any horse by accident. It consists in the animal over-reaching his stride, and in so doing he steps on the heels of a front foot with the toe of a hind one. An over-reach may cause a simple abrasion or a very ugly wound. Sometimes the wound is so severe as to cause the loss of a portion of the coronary cushion at the point injured, in which case the hoof will be permanently deformed.

As to the cause, indifferent shoeing may have something to do with it. For instance, unlevel hoofs for shoes that do not suit may throw a horse off his balance and in that way contribute to the accident; but the most frequent cause is carelessness or inexperience on the part of the rider or driver. In the driving horse it usually happens from the horse being driven to a break, or it may result from getting a shoe caught in a car track, or from being compelled to pull the horse up too short to avoid a collision. Sometimes it happens from recklessly turning a corner too short at a high rate of speed. In the saddle horse, the causes of over-reaching are much the same, i. e.—riding too fast, then pulling up too quickly, or with spur and bridle changing the gait at a fast pace, which often results in a general mix-up, in which the accident happens. It is a very common accident in England to horses used for fox hunting, and it usually happens in the horse landing over a fence or ditch, and being unable to recover himself quickly enough to get the front feet out of the way of the hind ones. Doubtless everyone has noticed some horses stopping suddenly after developing speed. The bridle acts as a break on the fore limbs, but its influence is not so readily exerted on the hind ones, and hence when pulling up too short the hind feet slip up on the front ones. In fact on smooth pavements it is common to see a horse slip up on his haunches, so it is needless to say that an accident which happens as a result of the carelessness or inexperience of the rider can not be remedied by the horse shoer.

In many cases the treatment requires the professional skill of the veterinary surgeon to heal a very ugly wound. As to preventative measures, it will invariably be found that all that is necessary is horse sense on the part of the rider or driver. The shoer should see that the feet are properly balanced and use shoes as light as are compatible with the work for which the horse is being used. On the hind feet use a low sharp heel calk as an anti-slipping measure. Make the toe of the hind shoe half round and smooth, so that in the event of an over-reach, the injury will be less severe than it would be if done with the square sharp edge of an ordinary shoe. For the front feet the best preventative is a properly fitting boot made especially for that purpose.

The Gas Engine For Smith Shops.

Prize Article.

WILLIAM MURPHY.

Six years ago we put in a gasoline engine, which was at that time the first and only one in our vicinity. Now we can stand in our shop door and hear the exhausts of eleven other gas engines, furnishing power for blacksmith shops, wagon shops, newspaper plants and grain elevators.

As to which is the best engine for the blacksmith to buy, we would be inclined to say any one of the various makes and styles. We have had to repair a great variety of gas engines, and have invariably found some good points in all of them. When we put in our engine we assure you that it was a very mysterious affair, that is, at first, but gradually we began to realize the simplicity of it, and as it whirled along day after day we felt like the owner of some pet animal after some especially fine performance.

Trouble? Of course we had trouble at first, until we began to look for cause and effect. Our advice to the possessor of a gas engine would be to study the machine, note the working of valves, and see that the compression is good. Without compression the gas engine is useless. The manufacturers of engines send with them books of information which covers all the principal points or causes of trouble so fully that the novice soon becomes proficient in the successful operation of the machine. This information, coupled with his own observations, very quickly puts him in shape to make all necessary repairs.

As to whether it pays to have power in the shop, we say that if your shop is small or large, employs a force of men or only yourself, you can not afford to be without a gasoline engine. It is so far ahead of steam that there is no comparison. You can start up and sharpen one plow lay on your trip-hammer and polish it and still make a profit. That is something that could not be done with steam. We have in our shop a five-horsepower engine which has been in constant use six years. Our repairs on it amounted to 80 cents in all that time.

We operate two emery stands, a

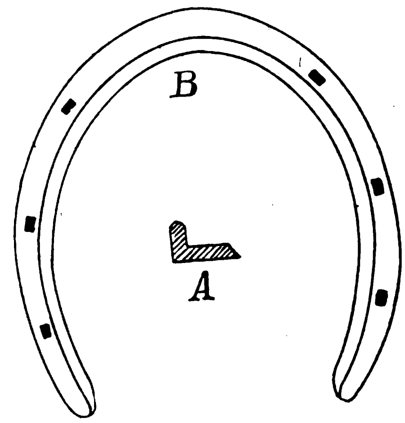


FIG. 16.—A, SECTION OF RIMMED STEEL SHOE B.

power blower for three fires, a large iron lathe, trip-hammer, disc sharpener, drill, grindstone, and a pump to furnish water for engine and grindstone; all these machines at work at the same time when necessary. Ours is a throttling engine and the speed can be increased or dimished at will.

We first paid 9 cents per gallon for gasoline, costing about 45 cents per day to operate. We now pay 15 cents per gallon, costing 75 cents per day. The engine is started and the person starting it goes about his other work. We have run our engine 12 hours a day for months without a single stop.

These are some of the reasons why every blacksmith and woodworker can add greatly to his pleasure and prosperity by putting in a gas engine. Any one having used a steam engine knows the annoyance of leaky boiler tubes, the expense, time, and trouble of refluing boilers, and the constant care and attention necessary to their operation, taking almost the entire time of one man in the shop, the constant worry demoralizing him for the little time he attempts to attend to anything else. In the time necessary to fire up a boiler and get up steam enough to commence with, he would have sharpened or polished a plow lay, ground a

couple of scythes, sharpened a couple of discs, or any one of a great many small jobs could be done that would bring in 25 to 50 cents simply by the unequalled co-operation of the gas engine.

After your work is done and you stop to shoe a horse, or any job where power is not necessary, there is no fuel going to waste; shut off the gasoline, turn off the water, and that is all. Where the shop is supplied with a well or hydrant it is much more convenient to connect the engine direct to well or hydrant than to use a water tank. You save the space and annoyance of sudden freeze-ups. It is much better not to have the water continually in the jacket, to soak the packing and finally to leak in the cylinder and cause trouble.

There are many reasons that might be given for the general use of the gas engine by blacksmiths and wood-workers, but the principal ones are their moderate cost; the certainty of your soon getting to understand your machine, so that the expense of operation depends on the price of gasoline; five times the amount of work turned out, your income increased accordingly, and the increase of patronage caused by running an up-to-date shop whether large or small. The foregoing has been truly our experience, and if any blacksmith is induced to put in power we can not praise too highly any good make of gas engines.

Gas Engine Power.

Prize Article.

W. M. TANNER.

I will give my reasons why a gasoline or explosive engine is better than a steam engine. I have a five-horse-power Fairbanks Morse gasoline engine (Fairbanks Morse Co., Chicago.) It runs all the machinery in an "Up-to-Date" blacksmith and repair shop.

If it were not for the gasoline engine I would have no power at all for the simple reason that there is no small shop that can afford to use steam as it is so expensive in attention and fuel. My engine requires little or no attention to run it, and the fuel is scarcely nothing compared with that of a steam engine. I can start or stop my engine in a minute's time. I have no steam to raise, no time to waste, and all the machinery is running at once.

I run my engine on three and a half gallons of gasoline for every ten hours, which costs me only about forty-six cents. It requires less space than a steam engine, which is a great advantage in many instances. It is much easier to keep clean than a steam engine, because there is no steam, no water, and no heat to corrode the gasoline engine. It makes but little noise, which is a great advantage over the steam engine, especially in shoeing nervous horses. There are two coal-operators in this city that are using gasoline engines for pumping water from their mines, at the cost of twenty-five or thirty cents per day. If they were using the steam engine, it would cost them fifty dollars at the union scale price per month for an engineer, beside their fuel and extra care.

A thirty horsepower gasoline engine and larger can be run 33% cheaper than a steam engine. This is in fuel alone. They create less heat in warm weather and last but not the least there is much less danger of their explosion.

Why the Gas Engine Pays.

Prize Article.

B. T. MCOBESNEY.

In the early days the smith could not get the improved tools and labor-saving machinery that one can now purchase for small sums, and hence while my father was a splendid mechanic, he could not turn out the amount and the different kind of jobs that I am able to do.—This is his own statement.—It is true there are smiths today who think it does not pay to invest much in tools and machinery in a small country town. Let me say that the day is at hand when the smith must get out of the rut. To do this one must have tools and machinery to help him do the work quickly and neatly. If you have a certain kind of work to do that you could get turned out better and in less time by having a machine to help you, then buy the machine. Such is the case with the gas engine.

I have used all kinds of power from hand power and horse power to steam power, and for two years past the gasoline engine has filled the bill and proved, first, the cheapest and best; second, always ready to start; third, requires no attention when not in use and very little when running; fourth, is no expense when not running; fifth, requires little room; sixth, the expense for repairs is very small, I not having paid out one cent for this purpose; seventh, you save time and this means money; eighth, many times you need power for a few minutes only and if you were to hitch a horse to a power or steam up a boiler the time spent or fuel used would be worth more than the job would come to.

I think I have given you a few of the best and most honest reasons why the gas engine pays. Following is a list of machines I run with my five-horsepower gasoline engine:

A screw cutting lathe,
A plow polishing outfit,
A drill machine,
A large disc sharpener,
A trip hammer,
A band saw,

and I intend putting in power blower. I can run any one at a time or all at the same time and have plenty of power to spare. I am going to close by saying to those who are contemplating the addition of power to their shop, be sure and get a good gas engine, take good care of it and you will say as I do that the gas engine is without a doubt the best known power for the blacksmith and wagon shop. I consider my engine will have paid for itself by the time I use it three years.

Does It Pay the Blacksmith to Put in a Gas Engine?

Prize Article.

BY G. F. S.

It does pay the blacksmith, and where there is a wood shop in connection it pays doubly. Last August we put a Palmer 3-horse power gasoline engine (Palmer Bros., Co's. Cob, Conn.) in our shop, which is a small general jobbing and carriage shop. We put up new work in winter to fill in time.

In the first place our trade has increased a lot, because we can get our work out quicker, and every blacksmith knows that customers like to get their work done as soon as possible. And then we have a lot of work that we could not do before, such as sawing, planing, etc. We have already done more than double enough of this kind of work to pay the running expenses of our engine for all the while we had it.

With our engine we run a circular saw, band saw, buzz planer, boring machine, sander, emery and drill. The drill is an ordinary handpower one. I took off the balance wheel and crank and put a pulley on in their place, which answers very well. Now I can drill more in one hour than I could before in four hours, and feel as fresh as when I commenced. I use twist drills and have not yet broken one. Another advantage is, they don't drill so quickly as when run slowly.

Smoothing up work now is a pleasure compared with the old way of filing. I think I can do more on the emery wheel in one hour than I could with a file in a half day and it is done in better shape too.

Knowing what I do now about gas

engines I would have one if for no other purpose than for drilling, as it pays good interest even for that alone, it costing so little to run it.

Our engine consumes about three gallons of gasoline in ten hours. It has not cost a cent for repairs, and never refused to go.

The only care it needs is to see that it gets oil in the cylinder. It takes about five seconds to start and the same to stop and when it is not running there is no expense. Then again, I think it a good advertisement to draw customers.

Last, but not least, power in the shop puts new life in the men. We all go about our work with a quicker movement and a lighter heart. What before was the hardest and most monotonous work is now the lightest and liveliest.

The Treatment of Knuckling.

W. B. ALLEN.

Knuckling, otherwise termed cocked ankles, may be described as a partial dislocation of the fetlock joint, in which the pastern becomes more nearly perpendicular, the lower end of the cannon bone resting behind the center line of the suffraginis. Knuckling is dangerous, because it makes the animal liable to stumble and to fracture of the pastern.

When cases of knuckling are met with in young foals, they will mostly be found temporary, disappearing as the foal becomes used to sustaining its weight. In older horses, erect pasterns, especially in the hind legs, predispose to knuckling. A club-footed horse with short, straight toe and high heel is very prone to it. In normal horses, it is often due to heavy work in hilly country or fast work on hard roads. Knuckling is also caused by diseases of the fetlock joint, the flexor tendons or the suspensory ligaments.

The treatment should consider the cause and remove it if possible. In the case of normal young foals nothing need be done. Where knuckling is a result of some other disease, this of course must be attended to. The tendons and ligaments should be relieved by proper shoeing. The following is recommended for knuckling: The toe should be shortened as much as possible, with the heels left high. If the hoof is prepared for the shoe in the usual way then the shoe should be thin in front with high heels or calks. A long-heeled shoe with calks gives the best results for hind feet. The horseshoer can thus often relieve the trouble, though not infrequently the veterinary must be called to effect a cure.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Bar Shoes.—Will some reader of these columns tell me the easiest way to make a bar shoe? JACK.

Erratum.—On page 149 of the May issue, the last word in the third line of the third paragraph should read "hub" instead of nut.

Rolling Colter.—Will some brother blacksmith kindly tell how to draw out a rolling colter so it would get a straight and nice edge? CARL PRESTBAK.

Shoeing a Club-foot.—Can some one through these columns, give me advice on shoeing a club-footed horse, as I am young in the work? BROTHER SMITH.

Plow Lays.—Will some other plow workman through the columns of THE AMERICAN BLACKSMITH, tell me how to prevent plow lays from warping while hardening? L. L. R.

Tempering Drills.—Will some one tell me a good way to temper a drill for limestone and granite? I do quite a bit of that work and would like to know a good method of tempering. W. A. CRAIG.

Tempering Sleigh Shoes.—In answer to the question of Mr. A. H. Blum, as to drawing the temper on sleigh shoes, would say, heat red and cover with sulphur. Let cool and then drill. ALEX BLACK.

With Regard to the Anvil.—I give the following, feeling sure that some smiths would be glad to know about the same. In order to deaden the sound of the anvil, as some anvils ring very loudly, hang a weight on the horn of the anvil. CARL BEREUTER.

A Number of Questions.—I would like to know how springs are treated at the factories. Are they really tempered, and if so how is it done? Also are spring drag teeth hardened, too? How are plow lays hardened, just on the face or outside? Can someone tell me? PETER LIMA.

Drawing Temper on Sleigh Shoe.—In answer to Brother A. H. Blum, as to drawing a sleigh shoe temper, heat the shoe to a bright red and just where you want to bore your hole, lay a piece of brimstone, and let it burn. This will soften it so that you can bore it nicely. Turpentine is good to use for boring hard steel or castings. Try it and see. C. R. C.

A Lame Horse.—I have a horse which has become lame owing to the bad roads in the spring. I think he has strained his leg, as the cords seem very sore. He is especially lame in going down hill. As he has to be on the road only every second day, he feels better after a day's rest. Can any smith give me information as how to shoe him to help him? W. A. CRAIG.

Removing Boxes from Hub.—As I used to have a great deal of trouble in removing old boxes from the hub without breaking them, I give the following method, which I find very successful. I take an old stub of an axle, heat it, slip it into the box and let it stand for a few minutes. Next I turn the wheel over, put a stick of wood on the box, hit with a light hammer and out comes the box. M. H.

Cold Tire Setters.—In answer to the question of Mr. William Darling, with regard to cold tire setters, would say that I consider the S. N. House machine to be the best. It will shrink a tire without damaging the wheel, and is all that is claimed for it. As I am somewhat acquainted with most all of the machines, I am prompted to give my experience for the benefit of brother smiths. J. S. MAYSE.

Shoeing.—I would like to have some brother smith tell me how to shoe a horse so as to make him pace. I have a large shoeing trade, and do nice work too, but I am having some trouble with a pacer. He trots sometimes and doesn't seem to travel square. He strikes the ground very heavily with his front feet. Also would like to know the best way to soften dry, hard feet in the summer. C. R. C.

Upsetting Steel.—I would like to ask H. L. Kibler, if it ruins steel to upset it. How would he make a 6-inch well drill out of 2-inch steel or a 2-inch rock drill out of $\frac{3}{4}$-inch steel. When I started to work here I had no hand hammer. I made a 3-pound hammer out of inch square steel and it is as good as the first day I made it. I took a piece 15 inches long and upset it to $3\frac{1}{2}$ inches. FRED RICKERT.

Knife Warping.—In answer to Samuel Krebbs, as to how to prevent knife warping, would say, heat your knife to the proper heat, plunge it perpendicularly into the water. Draw the temper on a hot iron. If you should put your knife in slanting it will contract on one side faster than on the other, and in this way warp. In tempering any thin piece of steel, cool it quickly by plunging it entirely in water. If you only cool the edge where it is thin, it will contract so quickly as far as it is cooled, the thick part retaining the heat and not contracting at the same time, that the part cooled will crack. M. HUBBARD.

Tempering Shovels.—In answer to Mr. Schuetz's tempering question in the May number, I would say, let him try the following method for soft center shovels:

2 parts cyanide of potassium.
1 " carbonate of potash.
1 " bicarbonate of soda.

Pulverize the above as finely as possible and mix thoroughly. Take an empty baking powder can and perforate the lid. Lay your shovel into the fire, face down, and heat until it shows a bright orange red, turn the face upward, and sprinkle the powder evenly over the surface. Hold at an even heat, until the powder begins to flux over the surface of the shovel, and then plunge in clear water. L. L. R.

One-heat Welding.—Touching again on the matter of welding axles, I wish to say a few words for the general good of young smiths, and to warn them against the time-devouring country practice of taking "sticking" heats, when the same heat would be sufficient to finish the weld if handled by an experienced smith.

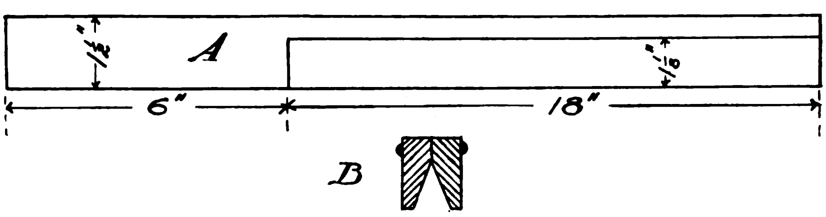
As to Mr. Bridwell, by his own admission, he is inexperienced and seems to have never gotten the idea that an axle weld can be done in less than two or more heats and get a "good job." When he writes, advising us how to save time, and then illustrates by taking two or more heats, where one should do, I protest that, instead of being offended at a just criticism, he ought, like other young smiths, who "don't know much about it," begin trying the one-heat

method and keep at it until in a very short time there will be no such thing as two heats on buggy axles, springs or other pieces that can be welded in one heat. The trouble is that those who still follow the "sticking" practice, never having worked in a factory or under a good, fast man, can hardly be persuaded that a weld on anything can be made in one heat.

He criticises my work on a Sarven wheel, but misquotes me or misreads me, in that I am accused of doing the work by beating on the flange and rivets. I advised driving the whole band down with a sledge, then plugging the open joint, setting tire and tightening rivets. I confirmed my remarks to a Sarven wheel, as my article stated, but Mr. B., after rejecting my advise on axles and wheels, asks me what I would do to a shell band wheel under like circumstances. I would tell him, but I fear my efforts would be misconstrued.

One can't make a new wheel of an old one, but it is a great help to a weak Sarven wheel to drive the whole band down and tighten the rivets. R. O'Hearn.

Plow Clamp.—In answer to Jack, this is the clamp I use to hold plow lays while tempering. Take iron ⅜ by 1½ inches, and long enough to cover face of 18-inch lay, leaving 6 inches for handle at heel of lay. Scarf to a thin edge on one side, full length, except the last 6 inches, leaving ⅜-inch unscarfed, as the sectional view shows. Make pieces like this, rivet together with six or eight rivets. This gives opening for lay edge to enter, as shown. Now bend front end edgeways to conform to lay throat. Drive this on lay before putting in bath. I use a plate 4 by 12 inches, with four upright posts to set lay in to hold its edge up while driving on. This clamp holds lay straight to edge, and also cools one inch on thin edge before getting in bath. The reason they crack in the throat is owing to being worked over, a cold shut forming. Work them for two inches in the throat with a good heat to relieve strain there. I have had the same luck with Star No. 1, and find the Ideal the best lay for high tempering.



DEVICE FOR HOLDING PLOW LAYS WHILE TEMPERING.

Change your bath compound to salt and you will have fewer cracks in steel. I use it in preference to potassium cyanide, sal ammoniac, or any other compound, after 12 years' experience in a soil very hard to scour. Alex. Black.

Axles and Skeins.—I would like to see published in your column of "Queries, Answers, Notes," a table showing the sizes of axles used on wagons with the different sizes of skeins according to the latest design, having wood axles. I believe the above would be of interest to wagon builders in general. W. H.

In reply, will state we doubt whether any table could be gotten up along the line suggested that would be of general value, as there are no two concerns who use exactly the same dimension axle stock, almost every manufacturer having his own patterns and shape, and special skeins are made to conform to same. Studebaker Bros.

From Far Australia.—I have been taking your journal for two years and should be able to judge its worth in that time—I think it is one of the best that has ever been published for the benefit of blacksmiths and any man who cannot learn anything from it should throw down the hammer and take to the plow. I have thus far succeeded in getting four smiths to take your paper, and for my part shall continue taking it as long as ever I am spared to lift a hammer. At some later date I will let you know the conditions of trade in Australia generally. R. C. Leonard.

Cutting Spokes.—With regard to cutting a spoke below the surface of the rim, it would seem to me that any one who has had any experience would know the result of this. Mr. O'Hearn says shallow the end of your spoke, letting the tire rest on the rim and the latter to settle sungly on the shoulder of the spoke. Now on such roads as we have, every time the wheel strikes a hard substance it will settle more snugly on the shoulder of the spoke until the end of the spoke reaches the tire and the rim is split and the spoke will rattle. If one is unable to make a joint, the spoke will settle into the rim and will look all right from the outside, but a little hard work will make it loose, and it is sure death to the wheel. Let some one make a wheel with one short spoke and the rest to reach the tire and use the wheel for a short time, and see how easily you can tell where the short spoke is. Phineas Jones & Co. say on their order blanks that they will not warrant a wheel where the spokes are cut below the surface of the rim. M. Hubbard.

The Apprentice.—I have read all the articles of Mr. Foster, also of Mr. Hubbard, on low prices and poor mechanics. I have studied that question a good many times, and have come to the conclusion that neither lien law, cash basis, nor examining board, will help us very much; by "us," I mean our generation. But it is up to us to do something for those that'll come after us. I should consider it a good scheme of every master mechanic, who takes apprentices, to first make a good and solid written contract with the father or guardian of the apprentice, to the effect that the boy shall stay for three or four years with the master mechanic and learn his trade. Let the boss blacksmith or wheelwright see to it that the apprentice does learn something. I mean give him a chance, try to raise the boy's ambition, but do not get everything out of the apprentice that is in him, and not have the boy every evening worked to death, and ready to drop. If we older people will do something like I have outlined, we will have pretty good mechanics all around us. The poor scab won't have a chance, and the good men may raise the prices and they'll get 'em without the least trouble. Franz Wenke.

Prices and Price Cutting.—Noticing prices quoted from many localities, I will give some of ours and if you will compare them with Mr. McElroy's, you will see they vary some here in Georgia:

Setting tires	$ .50
Hounds, per pair	3.50
Wagon tongues	3.50
Bolsters	3.00
Coupling poles	1.50
Setting axles	1.00
Rims	1.50
Spokes	15c and 20c.
Horseshoes	1.00
Scrape Work	10c to 20c.

There are three negro shops here, with prices not much more than half what I charge, yet I do more work than all three of them. I have a good equipment of tools and material. I believe in labor-saving tools and have just ordered a House Tire-Setter. I find the best solution of the price problem is to do your work well and charge what it is worth. A few cheap Johns won't patronize you, but you have lost absolutely nothing when you have lost their patronage. I have one customer who was never known to pay what a thing was worth until he came to me. He first tried jewing me down, and I referred him to the negro shop, telling him that I did things right and charged what it was worth, and asking him if he wanted me to give him anything. I lost the first three jobs, but he came to me with the fourth, saying to do it right whatever the charge. He added that he had to have it fixed so it would stay fixed. I fixed it, charging what it was worth. It stayed fixed, and he was pleased, so that he now gives me the work from his 20-horse farm, and doesn't kick, for he has learned I have only one price. W. D. Scott

Examination Law and Schedule of Prices.—A great deal has been said recently with regard to an examination law in order to compel poor workmen to leave the craft. I understand that this examination law would require us to go before a board of examiners and there answer certain questions. Will the fact that a man has been before this board and stood an examination be proof that he is a workman? I say emphatically, no. For instance, the smith for whom I am working has worked at the craft for the past six years, and today he cannot sharpen a plow properly, although he can answer almost any question you might ask him with regard to how a piece of work should be done. Again there is the man who has worked in the shop all his life, has always been a "botch," and will always be one. He in all probability knows how it should be done, but simply cannot do it.

I am strongly in favor of organization, and think the only remedy for low prices is for the smiths all over the country to organize and control the prices.

The following are some of my prices:

Shoeing, new, four shoes	$1.00
" old, " "	.80
Sharpening turning plow, 7 and 12-in.	.10
" " " 12 and 16-in.	.15
Sharpening sweeps, 8 and 16-in.	.10
" " 16 and 20 "	.15
" " 20 and 30 "	.20 and .25
Setting tires, cold process	.40
" " hot process	.50
Buggy shafts, each	1.25
" cross bar	1.00
" singletree	.60

Jack.

Gather of Axles.—In the May issue, Mr. O'Hearn states that I must stand corrected. This may be, but it will take more evidence than has as yet been produced. I have worked in six different States, and now hold a position that requires an experienced workman to fill, and this is the first time I have ever heard this subject disputed. We give the axle forward gather for the same purpose that we give it pitch. Pitch is given to obtain a plumb spoke, so as to have an even bearing on the axle arm and boxing. If your axle has no gather in the front, the wheels are inclined to run out, and the axle arm will wear be-

hind at the collar and in the front at the nut. We must therefore give it gather to overcome this. In order to do this we must use our judgment, as a certain fixed amount of gather will not do for all axles and wheels. We must gather them according to the taper of the spindle and the height of the wheels. A great many smiths have an erroneous idea as to why a wheel is given gather, believing that it will slip on the ground in proportion to the gather given. This is not true, however, unless you give it too much gather. If too much gather is given, the wheel will run to the shoulder and cause friction. If not any gather, it will run to the nut and cause friction also, Now we must overcome these two points by giving the proper amount of gather, so that the wheel will run easily between the shoulder and the nut. Unless this is done we have not reduced the friction to the least possible amount.

M. A. FOSTER.

Making Solid Eye.—In reply to Mr. A. W. Harvey, would say a good way to make a solid eye is to upset iron as in Fig. 1, according to the size of ring required. Bend and scarf like dotted lines as shown. Form ring and all is ready to weld.

To make rudder irons, take iron and bend to shapes A and B, Fig. 2. Forge two pieces like C and D. Fit together and weld one side from the center of the hole in one

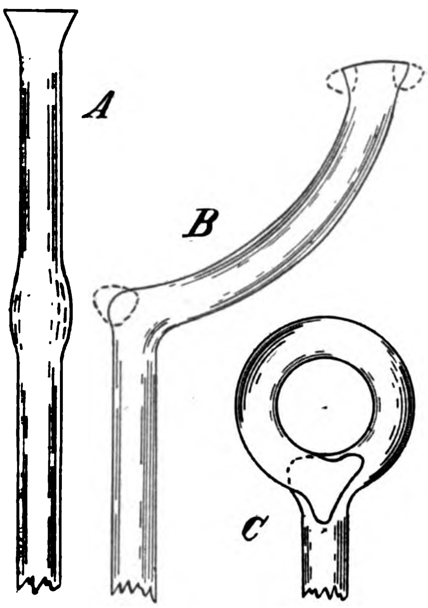


FIG. 1. METHOD OF MAKING SOLID EYE.

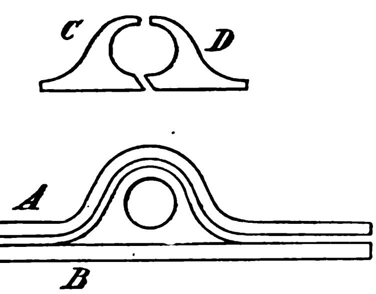


FIG. 2. RUDDER IRON FORGING.

heat. Then weld other side and drive in mandrel, so as to have the hole the right size. You then weld out to desired length and bend to size required. The same applies to the part with the pin, with the exception that pin and parts C and D must be solid.

P. LAMBERT.

Competing With Botches.—But you see how it is, Brother J. W. Buettner (in the May number). The little thing can't be done. If we had a law to protect the good smith, there would be a number of snides, the same as there are snide doctors, and many others that have to stand an examination. What are you going to do with the cross roads, smith? If we had a law, as you say, you could not stop them. They and the farmers both would be allowed to buy and own tools and if their friend and neighbor wanted to trust a job to them to do and was satisfied with his work, what can the law do? I can give my neighbor a dose of medicine if he wants it, though I can't collect a bill for it, but if he offers to pay me, that is our business. You can call them botches, self-made or home-made, or shop-made, just as you please, but they have come to stay. The longest pole gets the persimmon, and the smith who attends strictly to his shop, keeps it clean and neat, keeps good tools in good shape, above all, does good work, treats everybody kindly and everybody alike; charges everybody the same price for jobs of the same kind, who advertises and keeps abreast of the times by reading a good journal on his trade; this man will get there, botch or no botch. If one of them comes to me for material, or for advice, I give it to him and sell him material cheap. Then when he strikes a job he can't handle, he sends it to me. I give him my prices and tell him to charge no less, for his work is as honest as any one's, and he should have pay for his work. You will find the more you have to say about his work and the more you bar him out from your shop, the harder he will make it for you.

COTTON VALLEY.

An Interesting Letter.—Having been a reader of THE AMERICAN BLACKSMITH for a short time, I have come to the conclusion that it is an indispensable article from a blacksmith's point of view; as essential as his anvil, or at least I find it so, as I'm young at the business and find a great many helps by reading the experience of others.

There are two other shops in this place besides mine. I have no power in my shop at present, but expect to put in an engine next spring. I have an emery wheel, drill, disc lathe and tenoning machine which I have been running by hand, but I find as my trade increases I must have help in some way and have concluded that the gas engine is the cheapest. The prize articles on "Power in the Shop" are excellent, I think. I would like to ask the following question:

A few days ago I shod a driving horse with shoes about twice as heavy as the plates he was wearing. The next day he was brought back. I found that he struck his right hoof about half way up on inside quarter with his right foot. Heel or toe, I could not tell. The shoes had small mud calks on. He would go a rod or so then rear up and try to shake them off, first one and then the other. I shod him as level as I could. Will some one explain?

In welding axle stubs, would it be advisable to butt weld or is lap welding the proper way?

A. R. STOWE.

A New York Letter.—Enclosed find one dollar for my renewal subscription. I think the paper is all right and am interested in reading it and look forward to it every month. With regard to different methods for doing the same job, would say that in my opinion it does not matter as to the method used as long as it is O. K. when finished. We have had a very good winter, with a great deal of work, and good, fair prices and the outlook for the future is very bright. I have been in my present shop for fourteen years. At one time we had four blacksmith shops in the place, but the other three cut the prices until they were obliged to go out of business, so tha now I have the entire trade. I believe in good prices for work, and in doing good work, and then no cheap man can do you any harm.

As to the Lien Law, about which I have read so much, this may be all right in some counties, but as I have not lost ten dollars in the last fourteen years from bad debts, it would not benefit me much. If a smith loses on bills, I think it is his own fault, for if he thinks a man's credit is no good, why he should tell him so and not trust him. That is the way I do business.

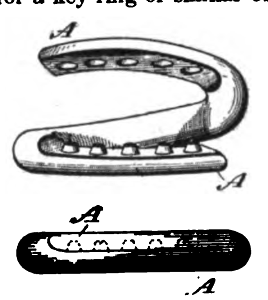
I have quite a handy shop, 20 by 46 feet, two rooms, with a stock-room overhead. I do all kinds of work, with the exception of painting. I build a good many new wagons, having built three the past winter, but prefer repairing and shoeing, as there is more money in it. The following is a list of prices in this part of Eastern New York:

Shoeing, per horse, No. 3 and under	$ 1.00
Shoeing, per horse, No. 4 and No. 5	1.25
Shoeing, per horse, No. 6 and No. 7	1.50
Setting shoes, per horse, No. 4 and under	.60
Setting shoes, per horse, No. 5, No. 6 and No. 7	.80
Sharpening shoes, No. 5 and under	.75
" " No. 6 and 7	1.00
Setting tires, per set	2.00
" " " " 3 in	4.00
New buggy tires, per set	5.00
New wagon tires, " "	
1½ inches	8.00
1¾ "	10.00
2 "	12.00
Rimming wheels—	
1¼ and under, per set	5.00
1½ per set	6.00
2 " "	8.00
New spokes, each—	
1⅜-inch and under	.15
1¾ and two inches	.18
2¼ inches	.20
New shafts	$1.00 to 1.50
Wooden axles	3.00 " 4.00
Wagon pole	2.50 " 4.00

WILLIAM SMALLEY.

A Patent Lap Ring.—Mr. Franz Wenke, Fort Wingate, N. M., is the inventor of a recently patented lap ring, shown by the attached figure.

The lap-ring may be formed of any desired material, for instance, wrought or malleable iron or steel, brass, or copper, when the ring is not intended to be opened for removal and replacement, and in the latter instance it should be made of spring-steel and properly tempered when desired for a key-ring or similar object adapted to be sprung open. The opposite free ends (A) of the ring are disposed parallel to each other and provided with abutting faces, which when the ring is opened and closed are adapted to move directly toward and from each other. The lateral projection upon one end enter the recesses upon the coöperating end, thus firmly resisting any longitudinal movement of the ends, which frequently occurs in this character of rings when tension is placed thereon. It also provides a ring which, when desirable, may be opened by a movement of the free ends directly from each other and closed in a similar manner, thus obviating the necessity



A NEW LAP RING.

of welding the rings, which cannot be successfully accomplished in many instances, such as in field work where the proper heat is not readily obtainable.

Shovel Tempering.—In the May issue I saw an inquiry from Mr. A. Schuetz on shovel tempering. For twelve years I have used salt in shovel and plow lay tempering, with good results. Take oil barrel or bath vat and fill with rain water with 75 or 100 pounds of salt (chloride of sodium) for tempering bath. Heat down the back of the shovel first to get the casting warm, then turn over on the face and bring up to a good heat. Now turn again and cover the face with salt. (I use a tin can with perforated bottom on handle.) Turn again and heat until white smoke rises well off salt and dip in brine bath. I might say that I have used prussiate of potash, cyanide of pottassium and others, but have found salt to be the best for shovel work.

ALEXANDER BLACK.

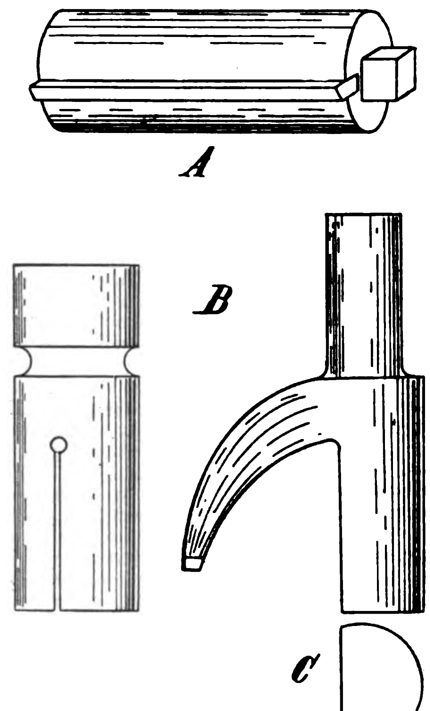
An Unusual Shoe.—Can anyone tell me where the following shoe is made? I have asked a number of blacksmiths and agents, but no one knows. The shoe is split from the heel to about the middle of the shoe and the inside of it bent up so that it springs when the horse puts his weight on it, and yet it is fixed so at the heel that when the horse puts his weight on it the inside does not go down in the hoof. There is an extra flange right at the heel to prevent that. I am very anxious to get this information, because a customer of mine wishes his horse shod with no other, as his horse travels so well in them. The smith who shod the horse before could not give me the desired information. Perhaps some other brother can. MARTIN KAFFITZ.

A Criticism.—In the May issue I noticed an article by Billy Buntz, to which I wish to take exception. I don't see any reason why one should use unfair means to get a customer to "bite." We will admit a contract is a good thing, but is it fair to our customer when we agree to "little or nothing?" Can we expect to build up a trade by lies and dishonesty? In the case of the horse owner in the said article, who was charged $5.00 where $2.50 was too much and then not done any good, and when he came back was charged $5 more, I should say the man would be a fool for taking his horse to such a smith in the first place. Billy Buntz would have us believe that we must resort to dishonesty, or at any event to underhand dealing in order to be a shrewd business man. I am in for good prices and good work, but let us maintain our reputation and honesty by all means. A. W. DUBOIS.

To Tin Cast Iron.—Referring to the inquiry of Mr. McDonald in the April issue, as to tinning malleable iron castings, I recently came across the following, which will probably help him.

To be successful in coating with tin the castings must be absolutely clean and free from sand and oxide. They are usually freed from imbedded sand in a rattler or tumbling box, which also tends to close the surface grain and give the article a smooth metallic face. The articles are then placed in a hot pickle of one part of hydrocloric acid to four parts of water, in which they are allowed to remain from one to two hours, or until the recesses are free from scale and sand. Spots may be removed by a scraper or wire brush. The castings are then washed in hot water and kept in clean hot water until ready to dip. For a flux, dip in a mixture composed of four parts of a saturated solution of sal ammoniac in water and one part of hydrochloric acid, hot. Then dry the castings and dip them in the tin pot. The tin should be hot enough to quickly bring the castings to its own temperature when perfectly fluid, but not hot enough to quickly oxidize the surface of the tin. A sprinkling of pulverized sal ammoniac may be made on the surface of the tin, or a little tallow or palm oil may be used to clear the surface and make the tinned work come out clear. Some operators again dip in a pot of hot palm oil or tallow at a temperature above that of the melted tin, for the purpose of draining the excess of tin and imparting a smooth, bright surface to the castings. As soon as the tin on the castings has chilled or set, they should be washed in hot sal soda water and dried in sawdust. B. B.

Cylinder Boring.—In answer to Mr. Hugginbotham's question in the May issue, if he wants to bore his cylinder out rough and ready by hand, he can take a piece of hard wood and turn it off to the size of the bore of the cylinder and somewhat larger. Be sure to make a fit. Then cut a ¼-inch groove in the block lengthwise and insert a piece of hard steel in the groove. Leave a tennon on one end of the block to turn it by. Cut $\frac{1}{64}$-inch, then draw out and put



A, CYLINDER BORING TOOL. B, TOOL FOR ENLARGING HOLES. C, BOTTOM VIEW OF END.

a piece of paper under the cutter and proceed to cut again until you get a smooth surface. Then take emery flour and polish by putting it on the roller, with grease.

The tool shown at B, will be found very useful to any mechanic in case he has to make a small hole larger. The left hand view indicates the way the tool is made, the upper part being drawn down to fit the drill press, the lower part fitting hole to be enlarged. J. VESTAL.

Some Nebraska Prices.—All the smiths here in Saunders County are in an organization, the following prices holding all over the county:

BLACKSMITH WORK.

Horseshoeing—	
Setting shoes, each	25c
New shoes, each	50c
Hand-made shoes	75c and up
Neverslip, per team	$5.00
Stable horses	50c to $1.00
Neverslip calks, each	5c
Polishing plows	$1.50 and up
New lay on plows, 14-inch	$4.00
New lay on plows, 16-in., $4.50; 18 in.,	5.00
Pointing plow	1.00
Sharpening " 14-inch	35c
" " 16-inch	40c
" " 18-inch	50c
Lister lay, new	$4.50
Sharpening lister	50c
Pointing lister	$1.00
Sharpening subsoiler	15c and up
New subsoiler, bottom	$1.00 and up
" " complete	2.00 and up
Sharpening Stk. cutter knives, each	25c
" " " disc, per knife	25c-30c
" cutaway " "	50c-55c-60c
Pointing cultivator shovels, per set of four	$2.25
Sharpening cultivator shovels, per set of four	75c
Sharpening grader blades	$2.50 and up
Axle stubs, per set	8.00 and up
Setting axles	1.00 and up
Welding axles	1.50 and up
Setting buggy tires, per set	$3.00
" wagon " "	2.00
Wide tires, 3-inch	75c
" " 4-inch	$1.00
Clip king bolt	1.00
Welding buggy spring	75c and up
" sickle	75c
Filling "	50c and up
Putting on ledger plates	7½c each
Welding pitman	75c
Fork on "	75c
Wagon wrenches	50c
Queen bolts	35c
Pole caps	50c
Welding pole braces	50c
" shaft irons	50c
Well augur steel	75c
Miscellaneous work, per hour	50c
Anchor rods, ½-inch	40c
" " ⅝-inch	50c
" " ¾-inch	75c
Telephone steps, each	9c

WOOD WORK.

Rimming buggy wheels, each	$1.50
" " ½ " "	75c
Spokes, full set, each	20c
One spoke	25c
Jump spoke	50c
Felloe wagon, each	25c
Setting box, new wheel	50c
" " old "	25c
Buggy pole	2.75
Circle in pole	75c
Doubletree	75c
Singletree	50c
New shafts, each	$1.25
" cross bar	75c
" seats	$2.00 and up
Axle bed	1.00 and up
Spring bar	75c and up
Side bar	$1.50 and up
Reach on buggy	75c and up
Head block	$1.00 and up
New tongues, complete	$5.00
" "	2.75
One hound for tongue	75c
Two " " "	$1.25
Cross pieces in tongue	50c
Axles, each	$3.50
Wagon reach	1.25
Hind hound, each	85c
Wagon bolsters	$2.00
Sand board	1.50
Bolster stakes	35c and up
Bent hounds	$3.00
New bottom in box	3.50
Cross piece in box	50c
End gate for box	75c and up
Dump gate, each	$2.00
Spring blocks	25c
New skein on axle	$2.00 and up
Bow socket for buggy top	75c and up
New bow in top	$1.50 and up
Steel shaft points	75c
Cutting down wagon	$9.00

G. H. GILCHRIST.

THE AMERICAN BLACKSMITH

A PRACTICAL JOURNAL OF BLACKSMITHING.

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Notice to Subscribers.

The following suggestion may save present and future subscribers to THE AMERICAN BLACKSMITH from loss through solicitors who falsely represent themselves as agents of this company. In any case where the canvasser is not known to the blacksmith and doubts exist as to his authority to collect money for this company, the smith should give his order for the paper to the canvasser, but should mail the money in to the company direct, mentioning the name of the solicitor. In this way the latter obtains full credit for securing the subscription, and the blacksmith at the same time protects himself from loss, should the solicitor chance to be dishonest.

Change of Address.

It is very important for those whose addresses are changed in any way to let us know promptly of the change. Complaints about non-receipt of the paper are usually caused by failure to do this. When an AMERICAN BLACKSMITH subscriber moves to a new location, or when his old postoffice is discontinued because of rural free delivery or other reasons, he should not rely upon the postmaster to forward his mail or advise us of the change, but he should always and at once drop a line to THE AMERICAN BLACKSMITH direct. Always give both new and old addresses.

Progressiveness a Necessity.

The blacksmith who runs a shop, like any other manufacturer or business man who wishes to keep up in the tide of twentieth century competition, finds it continually necessary to be adding to his shop equipment, and taking advantage of every new device that offers for turning out work better or more cheaply. The smith may often ask himself, using a well-worn term, is it worth while keeping up to date? Does it pay to buy new tools and keep abreast of the times? This is a most important subject, and one calling for careful thought. Many a man, after furnishing his shop with a good stock of tools and building up a nice custom by skill, attention to business and judicious advertising, has thought after a while that no one could take his trade from him. It is easy to understand how such a man would argue that the less money he spends for new improved machinery, the more he will have in his pocket at the year's end, and how he would look upon money spent in advertising as absolutely thrown away. Few men there are nowadays with whom such reasoning is not both false and fatal. Trade a man with you as many years as you please, the moment your competitor offers him the same article at a substantially lower figure than you can supply it, he will at once leave. And so it is that the man who thinks he has an everlasting corner on the custom of his neighborhood, goes to bed some night with the sad knowledge that the trade has gone to the other chap, the man who took advantage of every new tool that came out for cheapening his cost of production, and who took care to advertise the fact that he was in a position to do better work cheaper than it could be done elsewhere. If chap No. 2 is wise he seeks to retain the custom in just the way he obtained it, counting money put into tools and advertising as well spent. Water seeks the lowest level, and trade the lowest prices. In the strife of modern trade, success and even life depends upon the ability to turn out work cheaply, pointing to labor-saving tools and machinery as the solution of the problem. Letters are continually appearing in this journal testifying to the necessity and advantages of progressiveness on the part of the blacksmith who runs a shop, large or small.

Coming Conventions.

The twelfth annual convention of the National Railroad Master Blacksmiths' Association will be held in Indianapolis, Ind., on August 16, 1904, at the Grand Hotel. Arrangements have been completed, and an interesting as well as instructive time is promised to all who attend. Full particulars may be had by addressing Mr. A. L. Woodworth, Lima, Ohio. The following topics are on the program for consideration and preparation of papers:

Tools and Formers for Steam Hammers on General Railroad Work.

Spring Making, Repairing, Tempering, etc.

Tool Steel Forging and Tempering, including High Speed Variety.

Best Method of Testing Material and Selecting the Same for Use Intended.

Best Material and Methods of Forging Motion Work, as Links, Rocker Shafts, Valve Yokes, Eccentric Yokes, etc.

Best Form of Oil Furnace for General Locomotive Shape Work, and Burners for the Same.

Ideal Blacksmith Shop and Equipment for General Railroad Work.

Frame Making; Best Material and Methods of Preparing the Same from the Scrap.

Repairing Locomotive Frames, Iron and Steel; Best Methods and Material.

Formers for Bulldozers, Forging Machines, etc., including Air Presses.

The Carriage Builders' National Association is scheduled to convene in Milwaukee, Wis., for their thirty-second annual meeting during the week commencing Oct. 16. All who are interested

in vehicle manufacturing will find both welcome and benefit at this convention. For particulars address Henry C. McLear, Secretary, Wilmington, Del.

Triumph for Industrial Forces Vies with Artistic Achievement.

World's Fair, both in its Construction and Operation, Demonstrates the Great Power of Labor Scientifically Applied.

JOHN C. SMALL.

Masterful strokes, applied when the iron was hot, have wrought from the artist's dreams the magnificent picture that World's Fair visitors now look upon, and in contemplating the vision of beauty there is as much interest in studying the industrial forces at work as in admiring the artistic features of interest and they are represented not only in the construction, but in the operation of the splendid enterprise. It is here that labor demonstrates the best and most economic methods both by deeds and being done. As everyone is something of a laborer, the industrial becomes as great as the artistic.

American inventive genius still stands far away and ahead in producing new machinery, and perhaps in no line have the Americans made such strides of progress as in machine tools and the equipment of foundries and shops. The American inventor is ever alive to new necessities; in fact, he often foresees them and no sooner are the possibilities of an old device exhausted than he comes forward with a new machine tools and the equipment for a modern machine shop is an attractive feature of the Department of Machinery. For machines working in metal there are those operated by shock, compression, or tension; steam hammers, trip hammers and drop forging; machines for cutting, shearing, punching, stamping, counter-sinking, and shaping; rolls, draw benches, wire drawing machines; machines for stretching and flanging, and for bending, butting and welding and riveting. Other interesting sights are the methods of heating, annealing, tempering, cementing, welding and brazing. There are all the tools used with the forge and with the above named machines, as well as a full display of anvils, vises, hammers, shears, punches

THE PALACE OF MACHINERY.

The Palace of Machinery is 525 feet wide, 1,000 feet long and 265 feet high and cost $496,597. It contains a giant locomotive with wheels turn- at full speed, the monster electric switchboard used to control the lights and hundreds of engines and machines of all descriptions.

the achievement. Before creations of great minds were privileged to be exhibited to public gaze they stood the fire of the forge, and an approving ring of the blacksmith's hammer was necessary to the completion of the framework upon which has been weaved the most delicate fancies of the human mind.

Blooming flowers and verdant landscape are the tributes of nature to this scene of wonderland, but before the flowers could grow and the foliage flourish the pick and shovel made beds for them and the trained hands of labor nursed the plants to maturity. So it was that hammers and saws fashioned into shape the plans of architects, and great steam shovels cut a way for the picturesque lagoons. It is the industrial victories that make this Exposition a thing of such momentous human machine whose applicability is at once so obvious that one often inquires why it was not thought of before.

By this advancement in mechanical operations the milling machine has stolen the work from the planer in the machine shop. The gradual transformation has become so great that machinists today wonder how a shop would look if planers should do all the work that once would have been done on them and which is now done by other means. In many lines of work today it would require ten times as many planers in the shops as are used if the milling machines had never been invented.

These transformations in the machine shop have been fully recognized by the management of the Louisiana Purchase Exposition, and the display of both and dies, and various compounds for metal tempering, welding and cleaning.

There is on exhibit a full line of machines with cutting tools, like machinery for drilling, boxing, reaming and tapping, and machines for planing, milling, slotting and grooving. There are machines for grinding with grit, emery, carborundum and diamond. In the machine and forge-shop equipment are to be seen measuring tools and instruments of precision for testing shapes and dimensions.

Machines for working in wood are in every variety—for sawing, planing, turning, boxing, moulding, mortising, tongueing, grooving, shaping and carving, as well as for polishing and veneering. All appliances for wood-working machinery are displayed.

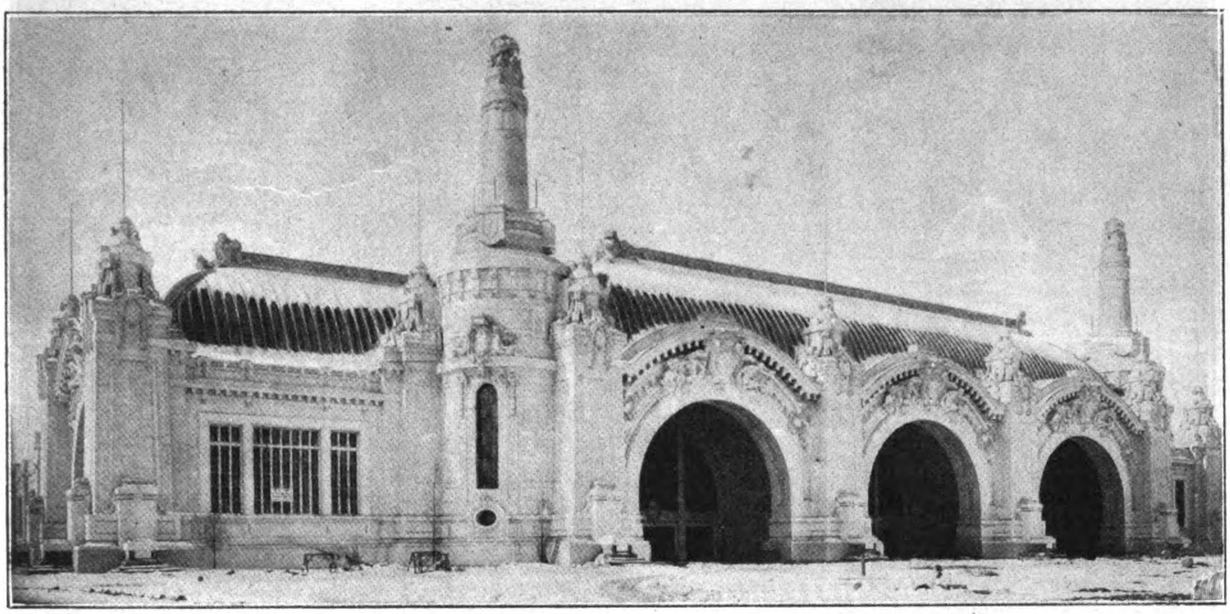
To AMERICAN BLACKSMITH readers,

the Palaces of Machinery and Transportation are undoubtedly the important exhibit buildings, for within their walls are housed the best that the world can

A VIEW OF ONE OF THE COLONNADES WHICH SURMOUNT THE TERRACE OF STATES.

produce in machine and metal construction.

In the Palace of Machinery, and covering an area of 200,000 square feet, which is about the size of a city block, is the installation of engines, condensers, moving machinery and other accessories making up the power plant of the greatest of all world's



THE PALACE OF TRANSPORTATION.

An immense building 525 feet wide, 1,300 feet long, covering fifteen acres. Fourteen permanent railroad tracks extend the entire length of the building and over four miles of tracks are used for exhibits.

fairs. Enter this palace from the North and you will see in front of you slightly to the left, a 5,000 horse-power reciprocating steam engine, which with its base has a total height of 54 feet, 20 of these being below the level and the remaining 34 elevated above the floor. This engine and its generator weigh over 500 tons and their value is approximately $150,000. To appreciate the size of this machine, have in mind a city house, with a street frontage of 25 feet, a depth of 60 feet, three stories above ground, and a basement and sub-cellar beneath. Remove this house and replace within the space the engine and generator that are on view There will barely be room to do so.

Next in line, proceding west through the central hall of Machinery Palace, you will see a 1,750 horse-power gas engine from Tegel, a manufacturing city near Berlin, Germany. Near by is a 600 horse-power high-speed engine from Harrisburg, Pa., a 750 horse-power medium speed steam engine from Cincinnati, and a 1,000 horse-power slow speed steam engine from Burlington, Ia. A tangential water wheel, from San Francisco, is the next exhibit. A steam pump from Jeanesville, Pa., causes it to operate by forcing water through a pipe and nozzle at the rate of 1,200 gallons per minute, and a pressure of 300 pounds to the square inch; this great volume of water strikes the buckets of the wheel, transmits its energy and falls as quietly as if poured from a basin. This water wheel makes 900 revolutions per minute, is regulated by a speed governor from Boston, and a meter from Providence regulates the flow. A 3,000 horse-power gas engine from Seraing, Belgium, is seen next, then an 8,000 horse-power steam turbine from New York and adjacent is a 5,000 horse-power steam turbine from Pittsburg, Pa. Near the western end of the central bay are four 3,000 horse-power reciprocating steam engines and three 80 horse-power exciter sets.

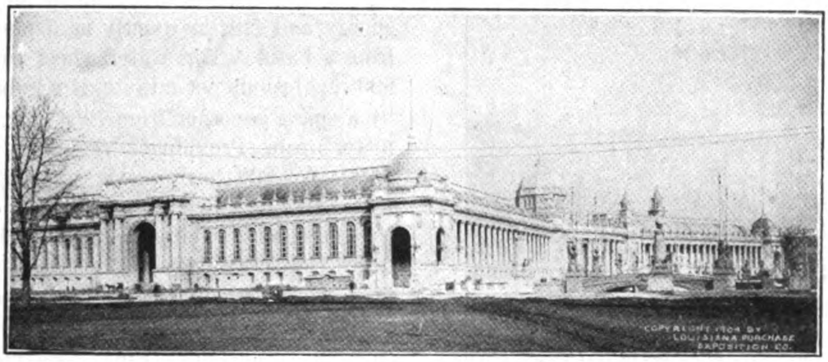
Such a line of prime movers has never been seen in the world's history, yet this is but one of the three lines installed in the western half of Machinery Hall. The line to the North consists of steam engines largely of European build, and drawn from the greatest works in England, France, Sweden and Germany. The line to the South, for the main part, is made up of gas and oil engines, the products of the great machine shops of the world. All types, speed and sizes are shown, from the little one-half horsepower gas engine for domestic use, to the great 8,000 horse-power steam turbine for the operation of lighting plants and trolley railroads.

It is much easier to talk of a steam turbine of 8,000 horse-power than it is

to understand what this enormous output of power means, and the difficulties which have been surmounted in the construction of the engine. For generations the rotary engine (which a steam turbine is), has admittedly been the ideal, but failure after failure relegated the rotary engine to the immediate vicinity of the perpetual motion proposition. Failure has finally been changed to success, and there is shown here in operation a rotary steam engine with its electric generator developing and transmitting 8,000 horse-power, and having a guaranteed capacity to deliver 12,000 horse-power. Twelve thousand horsepower means the combined average energy of 12,000 horses working in perfect unison, or a string of horses, harnessed tandem, and as close as they could comfortably work, over 18 miles long.

The Belgium gas engine is also a very wonderful achievement. No one has ever seen a gas engine of anything like 3,000 horse-power. The same builders exhibited a gas engine of 600 horse-power at the Paris Exposition of 1900, which excited more interest and comment than any other individual item at that Exposition. Here we have one with five times the capacity of the Paris engine. The unit installed in this Exposition covers a floor space about eighty-five feet long by forty-five feet wide. Its fly-wheel weighs 34 tons, has a diameter of 28 feet, and its rim travels at the rate of nearly a mile and three-quarters per minute. A medium size horse can be driven through its cylinders, and its two pistons each travel 10 feet at every complete stroke, making 100 strokes per minute each. The shipping weight of this engine is approximately 300 tons. About 30 tons of coal every day are consumed in the generation of the gas to operate it.

One hundred feet to the west of Machinery Hall is found the "Steam, Gas and Fuels Building," which covers an area of about 100,000 square feet, and is in itself an example of the most modern fire-proof construction. In this building are found great hoppers for storing the 4,000 tons reserve supply of coal, and mechanical means for automatically conveying this coal from the cars to the bunkers and from the bunkers to the furnaces and gas plants. The daily consumption of coal exceeds 400 tons, whilst the total length of the automatic conveyer lines is about three-quarters of a mile. Here are found boilers to furnish steam, and the gas producers to supply the gas for the operation of the engines in Machinery Hall. Briquette making, various types of mechanical stokers, forced draft apparatus, water purifiers, and exhibits of items directly related to the subject of steam generation and control are installed in this building.



PALACE OF VARIED INDUSTRIES BY DAY.

THE PALACE OF VARIED INDUSTRIES BY NIGHT.

All the Fair buildings are beautifully illuminated at night and this scene gives but a faint idea of the grand and imposing spectacle presented by the illumination of the entire grounds.

In its entirety, the power plant of the Exposition exemplifies and demonstrates the most modern practice as it prevails in this country and in Europe; it must engage the attention of the public by its manifest size and might; it commands the study of engineers, as showing practice with which they are not familiar and it demands consideration

by all who are financially or otherwise interested in the development and transmission of power. The lessons to be learned here open up new fields and possibilities and point to the accomplishment of new economies.

All equipments of steam railroads, from the inception of this means of locomotion down to the modern methods of transportation, are illustrated in the most comprehensive display ever attempted in the history of universal fairs. Not only is the progress of steam railways in this country demonstrated, but there is shown the present status of steam railroad transportation in all the countries of the world.

In the Transportation Building are to be found models of the most up-to-date wagons, carriages and automobiles, showing the latest improvements in all branches of vehicle manufacture.

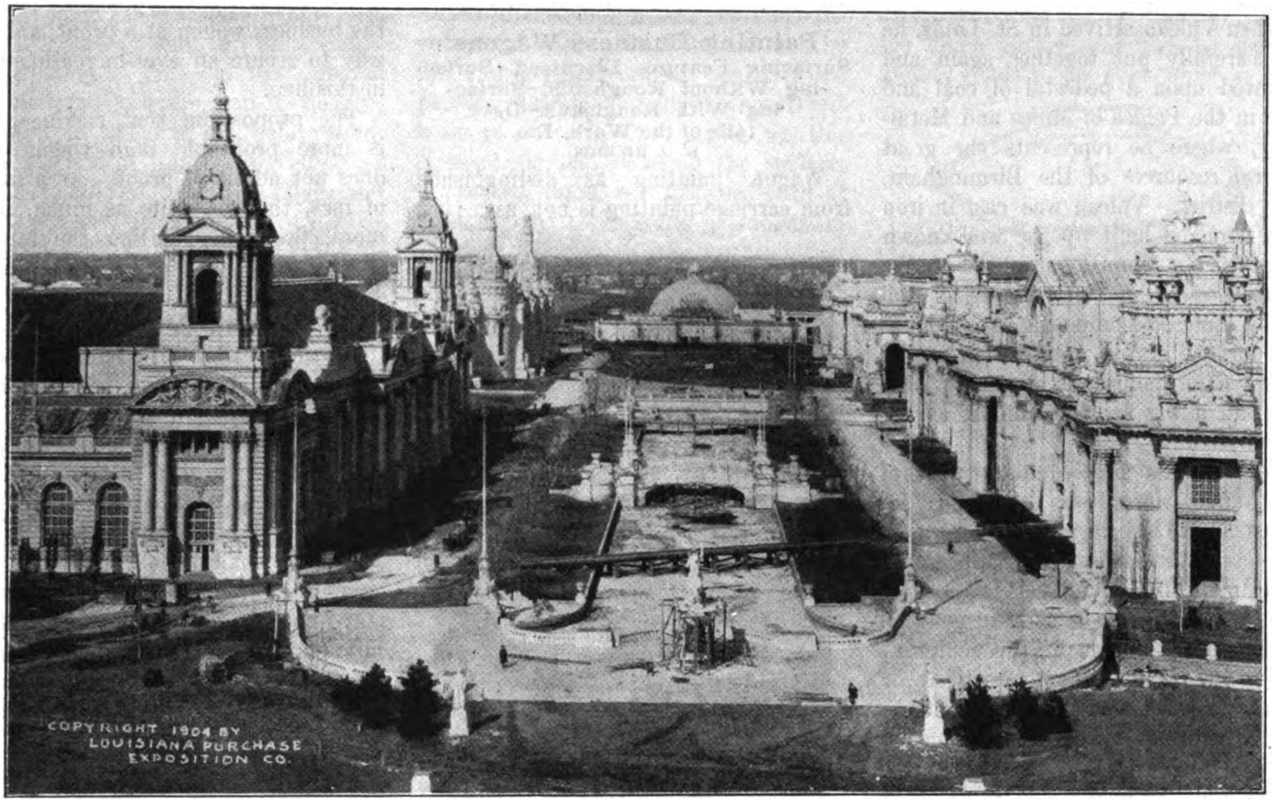
The railway exhibit, in the Palace of Transportation, is one of the largest at the Fair. The principal attraction of this exhibit is an immense locomotive, weighing over 200,000 pounds, running at full speed, on a steel turntable. The wheels of this giant turn at a rate which, were the locomotive on an ordinary track, would give it a speed of 80 miles an hour. While the wheels of the locomotive revolve at this great speed, the turntable moves more slowly by electric power and carries the engine round and round constantly.

One of the new and unique Exposition features is a series of laboratory tests of locomotives, with the findings of the judges made known each day. The comparative efficiency of modern European and American engines is tested by the leading mechanical engineers of the world. In fact, this is an international competition. During these tests a locomotive is run, or its wheels turned while the engine is still, at the rate of 80 miles an hour. The locomotive laboratory is a part of the exhibit made by the Pennsylvania Railroad system.

In the "still" exhibits are to be seen switches and crossings, transfer tables, turntables, models of bridges, and signal systems and other apparatus for securing the safety of traffic, and a display of track repairers' tools. There are also illustrated car heating and lighting; snow plows; shops for construction and repairs; engine houses; dynamometers and self-registering apparatus; time tables; cleaning and disinfection; tickets and ticket cases, posters, tariffs; methods and equipment for checking and handling baggage and freight, and, in fact, every detail that has brought modern railway transportation to the point of sending a passenger without mishap from Chicago to New York in 20 hours.

The Palace of Agriculture is the largest building on the grounds. It is 1,600 feet long and 500 feet wide, covers 18 acres and contains the cultivated products of the earth. Some idea of its size may be had when you think that this one building contains more exhibit space than all the exhibit buildings at the Pan American Exposition at Buffalo in 1901.

In summing up the great St. Louis World's Fair, you describe it to the letter when you say it is in almost every particular the largest ever held, as it contains the largest hotel, the largest watch, the largest locomotive, the largest gas engine and many other giants of their classes, in addition to covering a greater area than any other exposition.



THE COURT OF ST. ANTHONY LOOKING NORTH

Shows the Palace of Machinery and the Transportation Building on the left, and the Palace of Electricity and the Palace of Varied Industries on the right.

Seven Freight Cars Bring Vulcan.

Birmingham's Immense Iron Man Requires Almost Entire Train for Trip to World's Fair.

JOHN C. SMALL.

While St. Louis offers hotel accommodations in abundance, there is one visitor at the World's Fair who is unable to find a place anywhere in the Exposition City where he can lay his head. This stranger who is destined to stand upon his feet from the time the Fair opens until it is closed is Mr. Vulcan, of Birmingham, Ala., who tips

the scale at 100,000 pounds and stands 56 feet high in his new stockings.

Sleeping cars were not made with berths for Brobdignagians and Vulcan had to suffer several very serious surgical operations before his ponderous frame could be put aboard the cars for the trip to St. Louis. With his 15,000 pound head occupying one car near the engine and his feet, each six feet long, in a car to themselves near the end of the train, this giant sprawled out over seven freight cars looks very much like Gulliver strapped down by Lilliputians in Dean Swift's nursery stories.

When Vulcan arrived in St. Louis, he was carefully put together again and mounted upon a pedestal of coal and coke in the Palace of Mines and Metallurgy, where he represents the great mineral resources of the Birmingham, Ala., district. Vulcan was cast in iron from a model built by the well-known sculptor, G. Moretti, and all of the metal used in his construction, as well as the minerals composing the foundation for the statue, are from Alabama mines. The monster exhibit cost $20,000, and it has required almost a year to complete it.

More than a simple enlargement of the human form was required, for Vulcan's head is exaggerated by 2½ feet. This gives the colossus an appearance of symmetry from the levels from which he is viewed. Such a treatment of proportions is a part of the sculptor's study, but it is seldom practiced on such a large scale as in this instance.

Moretti designed the model in an old church building at Passaic, N. J., where a high roof permitted the frame to be reared, but the improvised studio was not properly heated and shortly after completion the plaster was frozen and the head began to crumble. The sculptor quickly loaded the structure upon cars and in the milder climate of Birmingham completed the model.

Then the casting of the parts began and such a feat as the foundrymen have performed was never before equalled. The figure was modelled in 15 pieces, dimensions of some of the sections being given as follows: Head, 7½ feet high, 7 feet across, weighs 15,000 pounds; circumference of neck, 11 feet 6 inches; circumference of chest, 22¾ feet; width across shoulders, 10 feet; length of arms, 10 feet; circumference of waist, 18 feet 3 inches; diameter of calf of legs, 4 feet 3 inches; diameter of ankle, 2½ feet; weight of spear head, held in right hand, 250 pounds; weight of hammer in left hand, 300 pounds; weight of anvil block, 6,000 pounds. The strap over the left shoulder and the apron worn by Vulcan are separate pieces and are used to strengthen the sectional joints.

The idea of having a giant statue made of iron to represent the vast mineral wealth of Alabama was conceived by Mr. J. A. McKnight. The cost of the statue was defrayed by contributions from Alabama people. Around the base of the big figure are displayed mineral exhibits from the State and miniature reproductions of Vulcan may be procured by visitors.

Painting Business Wagons.

Surfacing Features Discussed.—Surfacing Without Roughstuff.—Surfacing With Roughstuff.—Details of the Work, Etc.

M. C. HILLICK.

Wagon painting as distinguished from carriage painting is not, as a rule,

STATUE REPRESENTING POWER.

given the attention by the jobbing shop painter that it deserves. This is no doubt due in part to the scarcity of the strictly business wagon in the smaller towns and villages, and to the larger profits which carriage work appears to offer.

To the first proposition, it may be said that however small the proportion of business wagons, the work is quite worth while both as a matter of profit and as furnishing a variety of work not met with in carriage painting alone.

Painting the business wagon calls for the ability of the colorist, along with an uncommon degree of skill as a brush hand. The choice and harmonious combination of colors is indeed an all important consideration in wagon painting, and while at the present time a good grade of surfacing is demanded, it may fairly be said that surfacing remains subordinate to smart and effective color combinations.

To procure neat and inexpensive surfaces—surfaces fairly level and smooth—without the expense of applying and rubbing out the roughstuff as used in carriage painting, is a requirement connected with the painting of the business wagon of supreme concern to the jobbing shop painter, because if he is able to produce a good quality of surfacing at a moderate expense along with artistic and rich color effects, he has in large measure solved the problem of painting the business wagon at a profit, and in a way to secure an ever-increasing trade in this line.

The proposition that carriage work is more profitable than wagon work does not admit of proof. As a matter of fact, there is quite as much, if not more, profit in painting the business wagon than in painting the pleasure vehicle.

However, with this phase of the situation the reader of THE AMERCAN BLACKSMITH is able to inform himself outside these columns. It is more particularly with the surfacing question that we have to deal in this issue.

Surfacing Without Roughstuff.

The ribbed body wagon, with its succession of small panels, if returned for repainting over the old paint surface, may be treated after this fashion: First sandpaper with No. 1½ sandpaper, to clean off any possible scaly paint, and to cut the surface up somewhat into small furrows. Then mix and apply a coat of lead made up of one-sixth part raw linseed oil and five-sixth part of turpentine, adding a gill of coach japan to each quart of the mixture. Make the lead a light slate color by adding lampblack. Lay this coat on with a camel's hair brush, wiping out dry and smooth, and brush the pigment well into the furrows made by the sandpaper, thus giving the paint a foothold. This coat, under ordinary drying conditions, should dry out and harden sufficiently to sandpaper and glaze over in 48 hours. In damp or cool quarters not conducive to rapid drying, another 24 hours at least will be necessary to insure safe drying.

Next, take a keg of white lead and mix with turpentine and let stand over night. The turps will draw the oil from the lead and it may then be poured off. After eliminating the oil from the lead in this way, mix the lead in two parts coach japan and 1 part quick

drying rubbing varnish, adding a bit of turpentine to free the mixture from becoming salvy or gummy. Mix to a stiff paste, and with dry color, or with a japan ground color, color the glazing to a shade approximating the color to be used. Apply with a comparatively stiff brush. Let the pigment remain until it dries out flat, or without any gloss, and then with a broad blade putty knife go over the surface pressing the putty glazing into all the cracks and fissures that may exist in the surface. Work the glazing out clean and smooth, leaving but comparatively little of the glazing upon the surface. This will save a great amount of unnecessary sandpapering. This glazing should have at least 36 hours, and if possible 48 hours, in which to dry before sandpapering, and if rightly applied—that is to say, applied free from ridges and rough edges—but comparatively little sandpapering will be needed. This work may be made very expensive, or only moderately so, just as the skill of the workman has been exercised in putting the glazing on smooth and clean. The minimum sandpapering counts both in favor of the appearance of the surface, and in the economy of it. When the glazing has been applied and dried for, say 24 hours, mix up a putty made of dry white lead and coach japan, equal parts, and putty all gouges and deep abrasions of the surface. Do this puttying as smooth and as level with the surface as possible, in order that the minimum sandpapering may suffice. Directly upon this surface, when sandpapered, apply the color and bring to a finish in the usual way, choosing, however, a heavy body finishing varnish to finish with.

Surfacing With Roughstuff.

In case the surface is so badly broken and furrowed with cracks and fissures that a simple glazing is insufficient to bring it out intact and solid, proceed with the glazing as above detailed and then apply a single coat of roughstuff prepared as follows: Add to 3 lbs. of Keystone or other good American filler, 1 lb. of keg white lead. Reduce to a thick paste with japan and rubbing varnish, equal parts, and thin to a rather heavy brushing consistency with turpentine. Apply one coat of this roughstuff, and permit it to stand 44 hours before rubbing. Then in rubbing use a block of Eureka, or some other good composition rubbing brick, and employ raw linseed oil instead of water to dip the brick in. This will aid to avoid getting moisture into the cracks and fissures, causing them to enlarge and reassert their presence in the surface. When water is used, the fissures are apt to gather enough moisture to enlarge and exaggerate them, in which case it is next to impossible to again effectively conceal them under any ordinary structure of pigment. The surface having been rubbed, it should be wiped off with a soft piece of cloth, and set aside until the following day, before coating up with color.

With roughstuff costing close to $2.25 a gallon, if bought ground and ready prepared, and very close to that if mixed in the shop of first class ingredients—and a roughstuff should not be made of anything else—it behooves the painter to practice economy, consistent with good work, in bringing up this class of surface. Glazing the surface, if properly done, will dispense with at least two or three coats of roughstuff without detriment to the surface either in the matter of appearance or durability.

The business wagon with large panel wood top should, of course, receive different treatment. This, in addition to the regular coat of lead, carrying enough oil to fasten it securely to the surface, will require from 3 to 5 coats of roughstuff. To secure better density of surface, with greater uniformity in the depth of pigment, the coats should be applied at right angles in laying off. In other words, lay the first coat off with horizontal strokes of the brush, and the second with vertical strokes. So continue, thus building up a very solid and even coat of stuff. Surfaces of this class require very careful and clean rubbing with rubbing brick and water, and when finished they should compare favorably with the finish applied to pleasure carriages of the heavy build. Roughstuff for this class of wagons should be mixed of keg white lead and filler, equal parts, by weight, and equal parts, by measure, of coach japan and rubbing varnish.

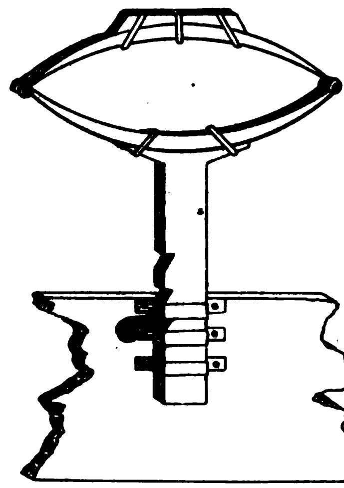
A Few Pointers on Wagon Work.

G. NABLO.

I will endeavor to give some pointers about wagon work, which I hope may be useful to some of the craft. As a light running vehicle is desired by all users, I will first talk on axle setting.

We often see many rigs, both light and heavy, which are noted for their hard running. The usual cause for this is that the axle has not the proper setting, being narrow in its track, although it has the proper length. The wheels are usually drawn in too much at the point where they meet terra firma, and therefore run in a cramped position, wearing the spindle on the top near the nut and the shoulder on the bottom. In the opposite extreme the same trouble is caused, the spindles being worn on the bottom near the nut and on top of the shoulder, this being common with wheels that are much dished. A vehicle suffering with any of the defects mentioned will run hard, and no matter how well lubricated, will always be one of heavy draught.

Again another defect might be the cause, and that is, that the vehicle has too much gather, and can be seen in muddy roads to do work which is only



AN ADJUSTABLE SEAT POST.

intended for the disc harrow, plowing and tearing up its track.

The only proper remedy for any of the above cases is to reset the axle, so as to have the wheel perpendicular under the spindle, or what is usually called a plumb spoke. In a dodged hub the front spokes should be in a perpendicular or plumb line, and only a slight gather of not more than 3-4 of an inch, which is sufficient. The vehicle, no matter if heavy or light, will then run much easier than before.

Now a few words as to a comfortable wagon seat. It is often necessary when bulky articles are to be transported, to have a spring seat for the driver that is above the load and yet still firmly fastened to the body or box. I have made many such, and will attempt to describe the same. Take a bar 1 1-2 by 5-8 and 20 inches in length, and weld on a cross piece of the same width six inches in length. Bend and shape to conform with the seat spring. Now, with a hack saw, cut three notches in the stem. Next, bolt or clip on the spring and put the stem on the proper place for the seat, about twenty inches

from the dashboard. Make three clips that fit over post and bolt them at certain intervals apart on the body or box, so that the stem can be easily moved up or down. Next make a dog to catch in these notches, resting in the middle clip, and the seat can be raised sufficiently high to allow many bulky articles, such as grain bags, boxes, etc., to be placed under it, and when the box is empty, the seat can at once be lowered to its usual place.

Another convenient arrangement is a gate for the dashboard, *i. e.*, a board fastened with hinges and held by two springs. An opener for these springs is made by bending an iron, 7-16 of an inch round, as shown in figure, fastened by four eye staples and with projecting ends that lie under the springs. When crank in center is pulled outwards it at once lifts both springs and the tail board can be easily pulled open by one movement.

A Little Talk on Wagon Repairing.

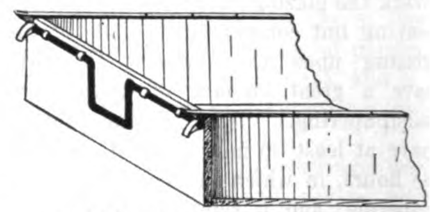
E. E. MERCER.

We have a wagon wheel brought to our shop for repairs that is dished till the spokes are badly out of plumb, although the material is good. We want to repair this wheel and use the same material. Now, to do it we must have the tools to work with, so we shall make them first.

We take a piece of $\frac{3}{4}$-inch gas pipe 5 inches long, and weld up a ring out of $\frac{1}{2}$-inch square iron just large enough to admit of inserting the pipe, and weld it fast on one end of the pipe. Now, take a piece of $\frac{7}{8}$-inch mild steel, forge one end down so it will go into the old end of pipe 3-4 of an inch. Forge with a fuller so as to have a square shoulder to fit against the end of the pipe. Insert into the pipe and weld. Cut off steel so as to leave two inches projecting from the pipe, and we have a splendid hollow driver, as shown.

Now, we take a piece of 1-4 by 1-inch iron, 10 inches long, bend and weld it up into a ring and then draw one side so it is 3-8 of an inch larger in diameter. Next bring it to an oval shape. Get an old spike, and saw 6 inches off from the small end, and bevel one end, so as to make a wedge.

Having the extra tools required for this job, we take the wheel, mark tire and felloe, just as we would for setting tires, take the tire off and place the wheel on the wheel rack outside up. (When we speak of the top of wheel, remember it is the outside.) Mark one spoke (1), and felloe opposite (1). Now, mark all the felloes, so that they can be replaced, as they are taken off. Remove the felloes and place them out of the way. Put ring on a spoke with the large side next to the hub, insert wedge on the top of the spoke and with a few good taps with a hammer on the wedge the spoke is out. Now, we find the tenon at the bottom is bent towards the top. We dress off the tenon so it is straight, being careful not to dress any at the outer end at tenon. When we have the spoke brought to its original shape on top side of tenon, we place the spoke in the vise, tenon up and with the rip saw split it the whole length of tenon, 3-8 inch from the bottom of the spoke. Make a wedge the full length of the tenon and as thick at the point as saw kerf, and 1-16 inch thicker at the butt than what we dressed off, plus the width of the saw kerf, and 1-8 inch longer than the tenon. Insert the wedge in the spoke and take out of the vise (see illustration). Insert the spoke into the hub and take the hollow driver,



DEVICE FOR OPENING TAIL BOARD.

place it on the tenon of spoke in place of felloe, and about three good blows with a 4-pound hammer should send the spoke home. We want to know that the spoke is driven as far in the hub as it will go. Now for another spoke, and when we have all the spokes redriven, we find the shoulder of the felloe tenon is a trifle longer on the bottom of the wheel. We take the spoke auger and square up the shoulder. Now replace the felloes as they come off. We may find them from 1 inch to $1\frac{1}{2}$ inches too short. We won't put in a longer felloe, but bore the spoke shoulders off till the felloes are the right length, and as they come together we find they are

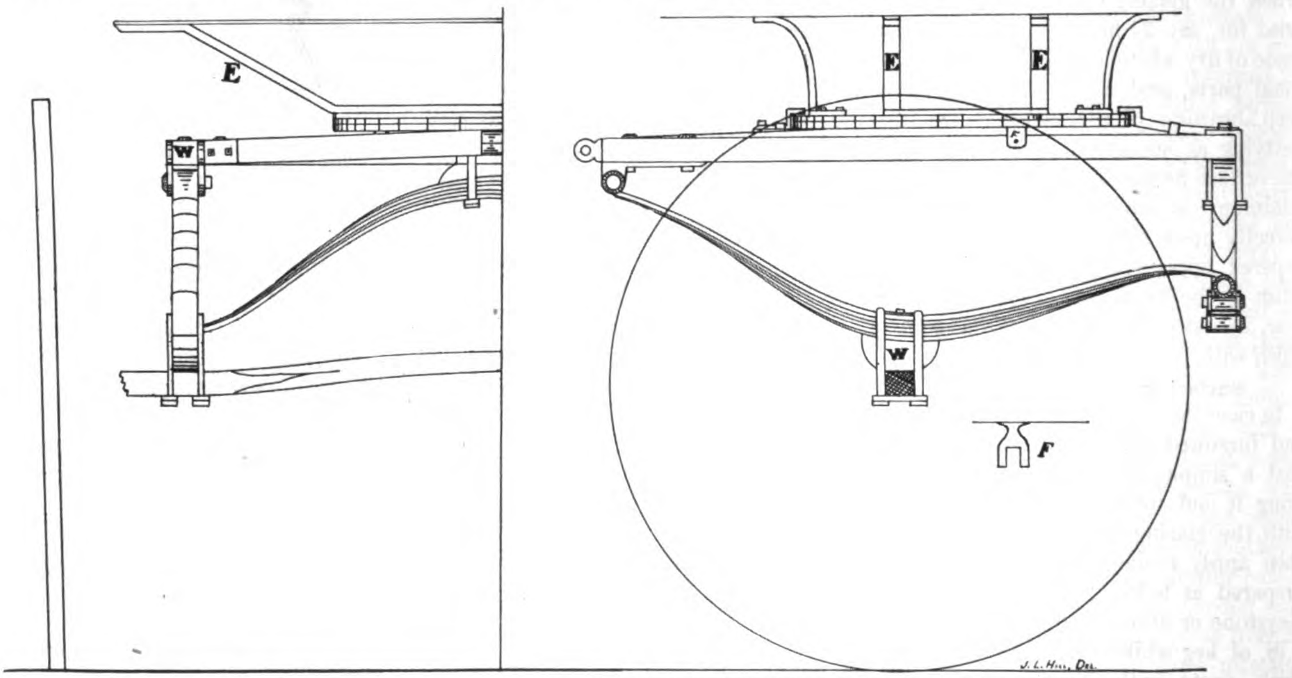
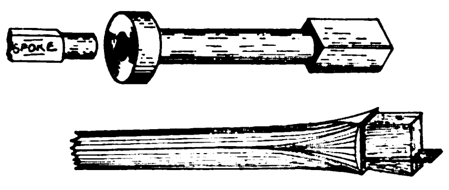


Fig. 2. HALF FRONT ELEVATION. Fig. 1. SIDE ELEVATION OF AN IRON WAGON FORE CARRIAGE.

(SCALE, ONE INCH EQUALS ONE FOOT.)

longer on the lower side. Run the saw through the joints so that they will fit up square. Now, we will wedge the felloes on, and we want them to fit tight on the shoulder of the spoke, and square and tight at each end.



HOLLOW DRIVER FOR SPOKES AND METHOD OF WEDGING TENONS.

We are now ready to dowel pin. Put a wood clamp over the joint to hold the ends of the felloes and bore dowel pin hole, using 1-2-inch bit. We want the pins to fit. (In case there are some other smiths like the one who was in my shop a short time ago and saw my boy making pins, and who remarked that my boy could make more pins in a half-hour than he could in a day and better, I will tell how I do it). Take a piece of iron 3-4 by 2 inches, punch a hole in it a little over 1-2-inch on one side and 5-8 inch on the other. Get some straight-grained ash or hickory,

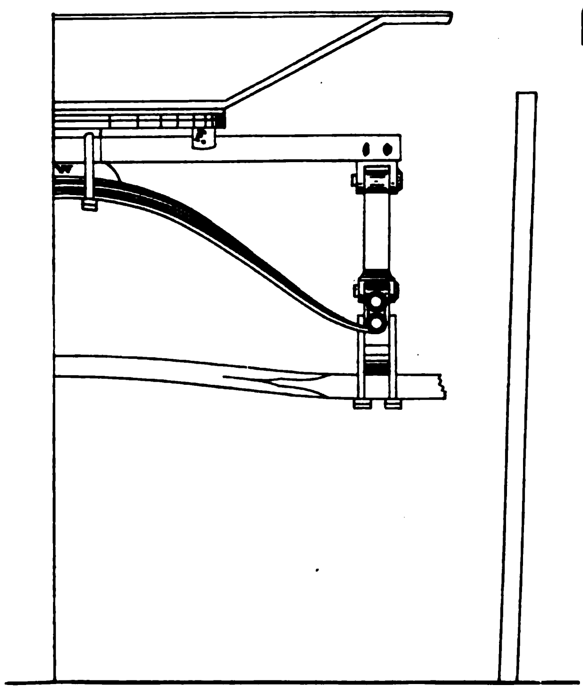


Fig. 3. HALF BACK ELEVATION.

saw in lengths of 6 to 8 inches, and split them up to about 1-2 inch. Lay the dowel pin iron on the anvil with small side of hole up and over the hardy hole; drive the pieces of wood through the hole in the iron and they will come out dowel pins as fast as you drive them in. Now, when we have all the pins in, saw off any wedges or pins, so that the rim of the felloes is smooth for the tire. In measuring for the tire, allow 1-8 inch cold for draw, and if we have been careful to have good fitting joints, we have a wheel as good as it can be made.

Iron Fore-Carriage for Wagons.

J. LAWRENCE HILL.

The illustrations presented for the readers' thoughtful consideration this month are somewhat in the nature of a novelty; not because they are impracticable, for those the writer has seen have stood the most severe strains, but because their use is uncommon; to many the idea may be entirely new.

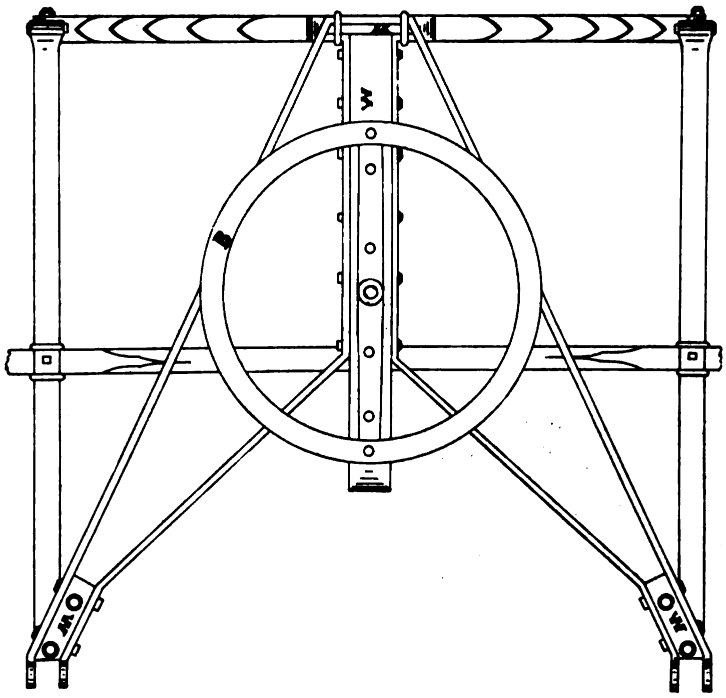


Fig. 4. PLAN VIEW OF IRON FORE-CARRIAGE.

The special features which commend themselves are simplicity of construction,—such that the man doing the smallest business with the minimum amount of tools can make,—easily repaired, and combine a lightness with strength that can not be obtained with a wood gear.

The only timber employed is marked W, and consists of three spring blocks, center piece, two pieces over the front end of the springs to which are bolted the scroll iron, and a filling in piece on the top of the cross spring.

Fig. 1 shows the side elevation; Figs. 2 and 3, the half front and back, giving the general appearance; Figs. 4 and 5 are more in the nature of detail drawings. B, C and D, Fig. 5, is a section at A; B, the lower portion of the fifth wheel; C, the upper, and D, the cross piece. On top of D is riveted the body support, E, Figs. 1 and 2. The scale for all drawings is the same; one inch equals one foot.

F, Figs. 1 and 3, is welded to the underside of the bottom part of the fifth wheel and riveted to the brace. An enlarged end view is shown in Fig. 1 to give a better idea of its shape. The braces are 1 3-8 by 1-2-inch iron, bent as shown in Fig. 4. Body supports 1 by 1-2 with 1-8 inch iron connecting each end to prevent spreading, fastened

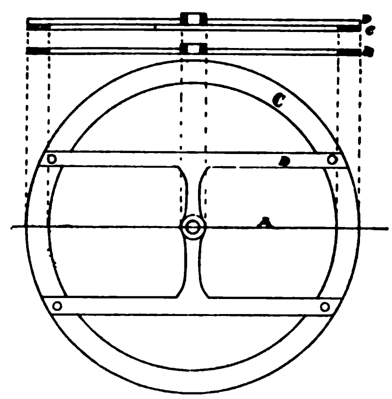


Fig. 5. PLAN AND SECTION OF FIFTH WHEEL.

at the top. Fifth wheel, 1-2 by 3-8 by 20 inches in diameter. Axle, 1 3-8. Springs, side, 38 by 1 1-2 by 7 inches; cross, 40 by 1 1-2 by 6. Wheels, 36; spokes, 1 1-4 inches. Bottom of body, 41 inches from the ground.

These can be altered to suit any requirements, although "taken from life."

The Blacksmith's Dinner.

"I have brought your dinner, father,"
The blacksmith's daughter said,
As she took from her arm a kettle,
And lifted its shining lid.
"I haven't any pie or pudding,
So I will give you this;"
And upon his toil-worn forehead,
She laid a childish kiss.

The blacksmith tore off his apron,
And dined in happy mood,
Wondering much at the savor
Hid in his humble food.
While all about were visions,
Full of prophetic bliss,
But he never thought of the magic,
In his little daughter's kiss.

While she, with the kettle swinging
Merrily trudged away,
Stopped at the sight of a squirrel,
Catching some wild bird's lay.
And I thought of many a shadow,
In life and fate we would miss,
If all our frugal dinners,
Were seasoned with a kiss.

HEATS SPARKS WELDS

August.

Month number eight.

Have you been to the Fair?

Now what do you think of power in the shop?

Never too late to mend,—also, never too early.

"A friend in need is a friend indeed,"—buy a gas engine.

Don't forget about our premiums and prizes given for new subscriptions.

Does the horse go lame now? What did you do to cure him? Send it in.

"A rolling stone gathers no moss"—but think of the pleasure it has in traveling.

That photo of your shop—have your sent it in yet to be reproduced in these columns?

Your trade is just what you make it. Advertise low prices and you will never get anything else.

The biggest horses are not always the best travelers; the loudest talkers are not always the best workers.

How much wood would a wooden saw saw? Choose or make your tools for the precise work they are to do.

Fly time now. A good pair of horse stocks will hold bad ones for the shoer, even when the little pests are at their worst.

That reminds me—perhaps you don't need a reminder about that job left undone, or that new comer unsolicited for custom. Perhaps you do.

Organization—what do the craftsmen in your locality think about this subject and higher prices? Some one has to start the ball rolling—why not you?

One smith we know of adds a neat sum yearly to his profits by making butcher and other kinds of knives. What extras have you?

Send it in. Every craftsman doesn't do things as you do them. If you employ any tool or method not generally known, let us hear from you.

Every man is the better off for a hobby, or some interesting pursuit outside his regular work that takes him away from his daily routine occasionally.

Buy, sell or rent a shop through an ad in our Wanted and For Sale columns. Many smiths use the same means for obtaining help or employment, also.

Your sign,—have you looked at it lately? We have seen several signs in the past month "crying" for paint. Is yours one of them? Call on the painter *now.*

Fools can find faults that wise men can't mend, but don't let that keep you from sending in a just criticism of any statements you find in this journal.

Coming are the days that make the perspiring craftsman wonder if after all he has not chosen the wrong vocation in becoming a blacksmith rather than an ice man.

The United States is the largest apple growing nation in the world. Over a hundred million barrels every year. Some smiths run cider mills in connection with their shops.

To prevent rust from forming on steel articles, place a lump of freshly burnt lime in the drawer or case with them. The lime absorbs a great deal of the moisture which causes rust.

"Delighted—best paper I ever saw!" That is what American Blacksmith subscribers say. When the time comes to renew, don't forget the special subscription rates for two or more years.

A hoof knife is one of the most popular articles on our premium list. Do you need one? Get some brother smith to subscribe to The American Blacksmith, and the knife is yours, free, postpaid.

A giant as far as screws are concerned, was completed some weeks ago in England. This screw, which weighs over 17 tons, is 85 feet long and was made from one bar of steel. It is the largest in the world.

"A welcome visitor to my shop." So writes many an enthusiastic craftsman about The American Blacksmith. Why not introduce this visitor to your neighbor? Send in his name and we will send him a sample copy for inspection.

Your competitor—did you allow him to get ahead of you in soliciting for new business? Of course, it's not going to happen again,—you know the value of the present, and how can he get ahead of a person always doing things *now?*

Spare time—many have climbed above the common-place by employing it profitably. *Time* is money, but *spare-time* is the money invested at 50 per cent., and paying a daily dividend. What do you do with your spare-time? Is it profit or loss?

Your brother craftsmen.—did they hear from you last month? Did you tell them of your convenient shop, your side-line, good prices, the systematic way you have of doing work? Let them know you are alive and willing to tell them anything not generally known about the craft.

A place for everything—a common enough saying, but one that means time and money to the methodical man who follows it. Of course, reader, your tools are always where you can put your hands right on them in the dark, your stock piles neat and in order, so this doesn't apply to you.

Advertising—what do you do in this line? It isn't a side-line, but is *one rail* of the main track. If you don't use it, your train of business will be "ditched." There are such things as one-rail roads, also business without advertising, but they are out of the ordinary,—they are not substantial. Get out a neat circular or hand-bill,—it need not be elaborate, but don't have it suggest rags and scrap-iron. Have it call out before one reads a word, *Work neatly done.*

A sad look covered Tom Tardy's face the other day when we dropped in to see our friend. It seems he had been doing some figuring, and that, not counting some items he carried in his head and wasn't sure about, he found he had over five hundred dollars that had been due him over three years. "What have I done about collecting? Well, I sent statements to most of 'em last November, but they didn't pay no attention. They owe it, and they ought to come in and pay."

The queerest horses in the world, as far as feeding is concerned, are probably those on a ranch in Western Australia. The ranch borders on a river, which widens into a pool, where the horses drink. During a drought five or six years ago, every bit of feed having been burned or scorched, an old mare discovered that there was plenty of luscious feed at the bottom of the pool which she could procure by wading and diving for. The succeeding generations of foals which she reared have all followed her example and appear to prefer it to the land feed.

A stream of water, having such a pressure and flowing at such a high rate of speed that an axe, no matter how heavy a blow is struck, cannot cut it, is operating a Pelton water wheel for a Nevada mining company. The axe will rebound just as it would from a steel rod traveling at high speed. The capacity of the wheel is over 100 horse-power, though it is but three feet in diameter. The head of water under which it operates is 2100 feet, equal to a pressure of 911 pounds per square inch, the outer circumference traveling at a speed of more than two miles a minute.

A despatch to the New York Times from St. Petersburg, under date of July 10, reads:

"At 10 o'clock, under heavy pressure our rear guard retired on our position at Makhuntsguiga and Yoalintas, three miles north of the Shuanlunsa Pass. The rear guard held this position under a heavy fire until 2 o'clock in the afternoon, when, in accordance with instructions, it retired slowly and in perfect order on the third position at Tchjoutzziandiandza, just as our main body was concentrating at Datchapu and on the position at Makhuntsguiga."

Our heartfelt condolences to all future Russo-Japanese war historians.

American Association of Blacksmiths and Horseshoers.

What have you done about getting the shops in your vicinity organized? Have you spoken to any of your brother craftsmen to find out what they thought of it? There must be some one to start the movement, and why should you not be the one?

Only about four months more remain now before cold weather and brisk business, giving ample time, if taken up at once, to get all the shops solidly organized into a harmonious body and prices raised to the level they should be.

Some one must undertake to get things going in your locality, and why not you? Send to us for the plans that we furnish free to any who think that their labor is not netting them what it should. Talk up the matter with brother smiths. Try it, and see if your county isn't really ripe and waiting for an opportunity of "getting together," to the splendid benefit of all concerned. Write us for plans today.

A meeting of the blacksmiths of Nemaha County, Kansas, was held on July 4 at Seneca, and was well attended in spite of the bad condition of the roads and uncertainty of the train service. A rousing meeting was held and two committees appointed, one on "By-Laws," and one on "Prices," to report at the next meeting of the Association, which is to be held at Seneca on August 7.

A meeting of the Seneca County Branch Association, New York State, was held at Ovid on July 9. After the usual business of the meeting was attended to, it was voted to divide the county into a north and south branch, and for the latter the following officers were elected: President, A. D. Marsh, Ovid; Vice-President, S. A. Darrow, Farmer; Secretary, Fred Griswold, Ovid; Treasurer, Ellis Crane, Kendaia.

Welding Locomotive Frames While Under Engine.

W. B. REID.

A correspondent asks: "Do you approve welding locomotive frames while frames are under engine?" The question is somewhat invidious, and one which most blacksmith foremen seek to evade from the conviction that the practice is of far less value and utility than is apparent to the minds of mechanics other than those familiar with the principles of sound blacksmithing.

However that may be, the subject is an important one. It is very evident that the requirements of modern railroad service demand some method of repairing frame breakage other than the delaying and expensive alternative of dismantling a whole locomotive to take the frame to the blacksmith shop; the more especially as the facilities in the average repair shop for handling such frames have not kept pace with the ever increasing weight of same.

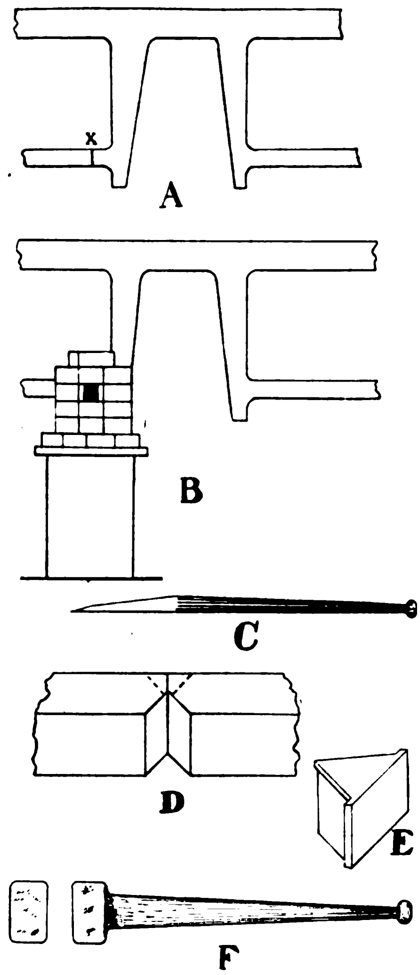


Fig. 1.—TOOLS USED IN WELDING LOCOMOTIVE FRAMES.

At the present time the welding of frames, in place, is followed to a limited extent on many roads, and without a doubt, by means of electrical and chemical processes now being experimented with, the method will be so perfected at no very distant date, as to become generally practicable.

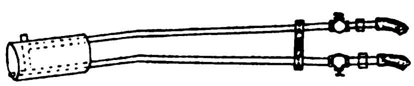


Fig. 2.—OIL BURNER FOR HEATING FRAME.

While the writer has had no personal experience in the matter, he is familiar with the method of welding frames on engines as practiced by several large shops, whose foremen have no objection to having a description given here for the readers of the AMERICAN BLACKSMITH.

Fig. 1, A, shows section of locomotive frame, the bottom rail of which is broken at X. First it is necessary to remove the wheels, and other fittings in the way of the smith, giving free access to both sides of the frame.

The rail is then securely braced to the opposite frame to keep it firm and immobile during the scarfing and welding operations to follow. A simple, improvised furnace of common firebrick and clay is then built around the broken part, Fig. 1, B, closely and compactly, to confine the heat as much as possible at the point to be welded.. The furnace is closed up at back, leaving an open space of one or two inches at top to permit the circulation of the air and flame. The side from which the frame is to be first welded is left entirely open for the insertion of the oil burner, and for the scarfing and welding operations which are all done without breaking down the furnace.

The frame is first welded from the inside so as to have the slight bulge, likely to result, upon the outside for easier manipulation with second heat.

The scarfing is done with a long chisel bar, Fig. 1, C, reaching across from opposite side of engine, cutting out a small V-shaped piece, Fig. 1, D; when this has again been brought to a good white heat, the cavity is cleaned out and a V wedge, Fig. 1, E, inserted cold. This wedge, it will be observed, is made with a cap or flange all around which enables it to be hung up neatly in the cavity of the rail and overlapping slightly the outer edge of the scarfed rail.

When the mass has again been brought to a good welding heat, it is welded with a long steel bar used as a ram, Fig. 1, F, shaped on end like a round-edged, narrow set-hammer. When one side has been welded in this way, that end of the furnace is closed up, the other end opened and operations repeated. To allow for shrinkage, the broken parts must be pulled apart, at least 3-16 of an inch at the very outset before beginning operations.

Crude oil is the fuel used. The burner is of very simple construction, consisting of a piece of 2½-inch round brass into which two 5-32-inch holes are drilled as shown by dotted lines, Fig. 2. The air and oil pipes fitted into one end of it are fully five feet in length, to allow its manipulation at a safe distance from the flame. These pipes are also bent as shown, to allow the free use of the welding bar while still using the burner. The burner is connected to a 30-gallon tank with suitable lengths of hose. The

tank, made from an old air cylinder, is conveniently mounted on wheels for moving around. The air enters the oil tank, thereby ensuring an equal pressure upon the oil and the burner. In operation the burner is held from 6 to 8 inches away from the metal, according to the way the oil burns. From four to five hours are required to weld and finish frame in this manner. Owing to the difficulty in the way of effective manipulation, as good and well finished a job cannot be secured as at the anvil, and the result on the whole cannot be considered of the most reliable and satisfactory kind, from the standpoint of good blacksmithing.

A method sometimes practiced is shown in Fig. 3, which consists in inserting a piece of iron between the fracture and welding together. This is the worst kind of practice, and a reliable weld is impossible under the circumstances.

By the method first described, fairly good results have been obtained, justifying its continuance in the attempt to overcome this constant source of annoying inconvenience in railroad service—the broken frame.

The Progressive Smith as a Business Man.—10.

How to Accumulate or Procure Money to Buy a Smith Shop.

BILLY BUNTZ.

The progressive smith knows that he but needs to step out among the people to notice how thoughtlessly or carelessly folk in general spend money, in contradistinction to the way he had to do in saving or accumulating to buy his smithshop.

Indeed, having a capacity for earning money is quite a different thing from having the ability to save it. Oftentimes a workman who makes three or four dollars a day is heard to say, "I can't save anything!" Should he be pitied or censured? True, some men have large families, a great deal of sickness, or meet with unfortunate reverses, so that at times they are unable to save, but many men are naturally careless or wasteful in handling money, not knowing how to live without emptying their pocket every time it feels a little heavy.

The principle of true saving is not so much a matter of *hoarding dollars*, as it is the *practicing of self-restraint*, or spending only when it is considered absolutely necessary or essentially judicious. A parsimonious man, who is always thinking about the "mighty dollar," or continually endeavoring to hoard thousands of them like a miser, is seldom liked by anybody, as his greed causes him to not only deny himself many good things that he could well afford, but to refuse to spend for worthy causes.

On the other hand, there is the frugal man, who suppresses expense on himself or his indulgences, whilst likely being liberal with others.

Then there is the economical man, with more or less ability as a manager—especially in handling money—by regulating his expenses according to his circumstances or adapting his expenses to his means. Economy cuts off waste-

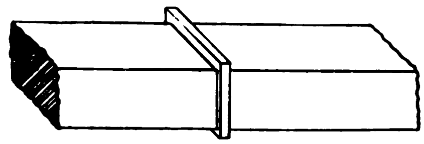


Fig. 3.—AN UNRELIABLE METHOD.

ful expenditures, extravagance, or the spending of money superfluously or lavishly, hence this kind of saving merits approval, as the money can be invested or put to good uses; while the man who hoards money for money's sake, or the man who spends it thoughtlessly or carelessly, seldom reaps any real benefit. Perhaps worse still is the man who spends recklessly or uses his money as though it were a weapon. It is the bad uses to which money is put that makes it "the root of all evil."

So intense is the desire of the average man to spend money as soon as it is dropped into his fist, that it has been said that were all the money in the universe to be equally distributed among the people, few of them would be able to hang on to any of it, thereby allowing it to get back into the same hands whence it came. For this reason, as well as other obvious ones, rich folk are loath to aid poor people, knowing if a man can't become self-reliant while he is working or earning money, that nobody can do much to help him, beyond trying to make an impression on him by giving him "a barrel of advice" on how to better his condition. However, it often happens that a poor man will buy things that are little needed, simply because he can't get the habit of saving.

Then there is the man who insists upon living in a trust-to-luck fashion, spending and having a "good time" with every dollar he gets. Were he censured, he would say, "Guess it's my business, not yours!" However, very few people care how he gets along. If he himself can't see any good in saving, he may as well be allowed to dwaddle, spending it quickly for fear it might burn holes in his pocket.

The habit of saving is best acquired at an early age, although there is no good reason why even an old man can't learn it. Many a progressive smith of today not only became expert in smithing while serving his apprenticeship, but by being watchful, careful and economical in handling his earnings he acquired the *habit of saving*, as well.

Our friend Jones, whose success as an advertiser was given in the August, 1903, number of THE AMERICAN BLACKSMITH (page 215), saved money during his apprenticeship by following the advice of his parents, relatives, employer and others who were interested in his welfare.

"Although your income will at first be small," his father told him, "yet if you hope to save to buy a shop you must deny yourself from going to every circus or the foolishness of spending money on 'goodies;' rather, you should save what little you can and invest it as opportunity presents itself. It'll make a man of you; it's for your own good."

His uncle next took him in hand.

"The habit of saving," the uncle said, "is seldom acquired instinctively, else most folk might become well-to-do, although sometimes it does seem that some men had inherited a bit of thrift from their ancestors, but it is more likely they received a lesson from their early surroundings or bringing up that gave them the incentive which at once started them in the path of 'a penny saved is a penny earned.' However, the habit of saving is acquired more generally through the *practice of economy*, and is something with which a novice must for a while grope in the dark, as he would in learning an art or serving an apprenticeship at a trade. It is not always so much the *amount* that is saved, as it is to get the habit of practicing economy thoroughly instilled into a man's make-up. Here's our banker; ask him about it."

"The habit of saving, young man," said the banker, "is an art unto itself. It brings self-reliance, independence. The man who doesn't save has no security or visible assets, and is so treated in the business world, therefore nobody is willing to trust him beyond a small loan, dependent upon the size of his job, his character and reputation, and the worthiness of his friends. By saving money you can make business investments, buy a home or a work-

shop, or aid good causes, while by spending all your earnings you're like a ship without a rudder—you don't just know where you will land, if you succeed in landing at all. The theoretical idea that the man who makes the most money ought to be able to save the most, seldom 'pans out' practically, for the reason that all folk do not live alike; many are extravagant; quite a few are careless, while some, on account of their recklessness or inclination to spend every cent, are known as 'spendthrifts.' Nobody can save if he doesn't try. The man who would save must watch his expense account,—particularly the personal items. It has been said that a dollar requires more watching than a thief."

Having been thus advised, young Jones signed a contract with an expert smith to serve an apprenticeship.

"Your regular duties," said the smith, "are to keep the shop clean, the tools in place, and help me. You can begin on that old buggy out there, taking it apart and saving all the good bolts, nuts and trimmings."

While he was working he watched him and told him how to handle the job. "I paid only a dollar for it," he said, "and expect to run a couple of the wheels in on repairs."

Likewise young Jones handed him tools and watched him shoe until one day when no one was around he let him try his hand, correcting him as he worked.

"I'll let you do some wagon work next year, but first I want to get you well started on shoeing. In the meantime you might buy So-So's book on shoeing; it'll give you some good ideas in connection with your practice.

THE AMERICAN BLACKSMITH advertises a number of good books for the apprentice or smith. They cost only a dollar or two, while the practical instruction they contain brings a craftsman to perfection. "He who empties his purse into his head, nobody can take itaway from him." Nothingearnsmoney so fast as *human energy*. Hence the better the workman or the greater his capacity for work, the more money earned. A thousand dollars at interest brings at most only a hundred dollars a year in interest. The smith who increases his ability and capacity for smithing by reading practical books and using up-to-date tools, increases his income the same as he who has money at interest becomes more progressive and *saves money*. Expenditures which bring profitable returns are *economical*.

"I completed my apprenticeship in about three and a half years," Jones would say, were he asked. "The first year I saved only $10, although I bought several trades books and a set of tools. The second year I saved $50, the third year $100; the fourth year I got smithing wages and saved $200. Some apprentices might have a hard time doing as well were they to have any drawbacks, while others might easily do better, but the fact that I acquired the habit of being economical had much to do with my future success. With this $350 I made my first payment down in buying a smithshop. It was my stepping-stone, otherwise I might now be working for somebody else. I also found to be true the saying, "Success makes success as money makes money." Having succeeded in some ways, I continued to follow the same principles that first helped me, spending my dollars as I thought they would bring me profit, or banking them when I was undecided."

The accompanying table shows what per cent. of his wages the smith pays who is a renter. The progressive smith knows that the brother who does not or will not save is hopelessly chained to the landlord, because, being without money, he has little or no credit, therefore can't buy; whereas, if he would begin *now* to save a little he would soon become self-reliant and independent. The smith who has saved from $200 to $500 can invest it in real property, or use it in part payment, giving the present owner a mortgage on the shop as security for the balance; or he can borrow the balance from the bank or loan company and give them the mortgage. The following table shows—

The Cost of a $1,000 Loan.

To Run	At 6 Per Cent.	At 5 Per Cent.
3 years	$1,180	$1,150
5 years	1,300	1,250
6 years	1,360	1,300
8 years	1,480	1,400
10 years	1,600	1,500

No smith should pay more than 5% or 6% for a loan. Almost any smith can pay off a loan of $1,000 in five or six years; in which time he would have paid less interest on the loan than his rent would have amounted to had he continued paying out money toward the support of a landlord. Where the home bank does not do a general loan business, the smith can readily obtain money of a Building and Loan Association. The latter may give him the privilege of paying off the loan in monthly payments of $10 or $15 a month, as well as of decreasing the loan by a lump payment at any set time.

No smith would like to hear his landlord say, "You paid for this shop, my good friend, during the ten years you have rented it, although I had to borrow the money in the start, the same as you could have done; but the difference is, I own the shop,—you don't own a stick in it."

Smiths, *become your own landlords.*

The next issue of THE AMERICAN BLACKSMITH will contain "How to Buy a Smithshop."

Per Cent. of Wages Paid For Rent.

	WAGES.		
Rent Per Month	$2.00 Per Day	$2.50 Per Day	$3.00 Per Day
$10	20%	....	....
12	24%	18½%	....
15	30%	23%	20%
18	....	28%	24%
20	....	....	26¼%

The averages of above table are: Wages, per month, $63.33; rent, $15; percentage of wages paid for rent, 23⅔.

These figures presuppose that the smith is a renter; that he works 26 days every month, and earns the maximum amount of wages. The loss of only one day during the month decreases his income and increases the ratio of his rent to wages earned; the rent goes on whether he works or not.

The smith who makes wages as above, after having deducted his incidental expenses, can readily see what a large percentage of his earnings goes for rent. The same table applies to renting a home. However, the salaries quoted are not intended as standard for any smith, being used merely to show him where his money goes should he be earning wages and pay rent as above mentioned.

A Treatise on Horseshoeing.—7.

JOHN W. ADAMS.

Shoeing in Connection with "Interfering," etc.

A shoe to prevent interfering is shown in Fig. 12. It is a narrow right fore hoof of the base-wide (toe-wide) standing position, shod with a plain "dropped crease" shoe. The dotted line at the inner toe indicates the edge of the wall which was rasped away in order to narrow the hoof along the striking section. Note the inward bevel of the shoe at this point, the dropped crease, the distribution of the nails, the long,

full inner branch, and the short, close outer branch.

Fig. 13 is the hoof surface of a right hind shoe to prevent interfering. The inner branch has no nail holes and is fitted and beveled under the hoof. Note the number and position of the nail holes, the clip in the outer side-

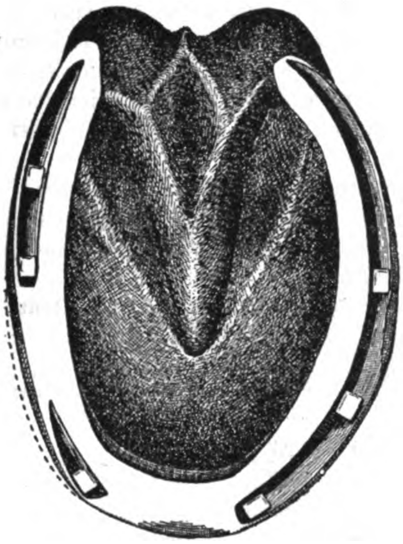


Fig. 12.—A SHOE TO PREVENT INTERFERING.

wall, and the narrowness and bend of the inner branch. The inner nailless branch has the thickness of the outer branch plus its calk, so that the inner and outer quarters of the hoof are equidistant from the ground. The ground surface of this shoe is shown in Fig. 14.

Fig. 15 is the side view of a fore hoof

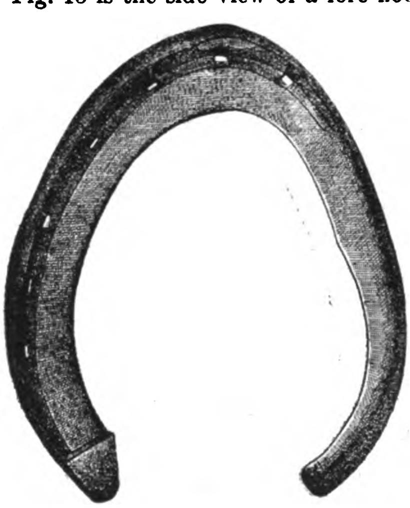


Fig. 13.—A RIGHT HIND SHOE TO PREVENT INTERFERING.

shod so as to quicken the breaking over (quicken the action), in a forger. Note the short shoe, heel calks inclined forward and the rolled toe.

Fig. 16 is the side view of a short-toed hind hoof of a forger, shod to slow the action and to prevent injury to the fore heels by the toe of the hind shoe. Note the elevation of the short toe by means of a toe calk and the projection of the toe beyond the shoe. When such a hoof has grown more toe, the toe calk can be dispensed with and the shoe set further forward.

Fig. 17 represents a toe-weight shoe to increase the length of stride of fore-feet. The nails should be placed farther forward than they are in the illustration, which shows them too far back, although the weight is properly placed.

In Fig. 18 is shown the most common form of punched heel-weight shoe to induce high action in fore feet. The profile at the right of the shoe shows a roll at the toe and swelled heels. The weight is well placed, but rolling the toe and raising the heels lower action. The shoe would be much more effective if of uniform thickness and with no roll at the toe.

Fig. 19 is shown to illustrate an ice shoe for a roadster. It is a right fore shoe. The toe and outer-heel calks cut at right angles, and the inner calk is slender and blunt. The back surface of the toe calk should be perpendicular.

The Making of a Plow Share.

BARRY RUSH.

The following is my method for making a plow share with short landside. The first step is to make the landside point. Use 3 by 5-8 inch iron or mild steel. Cut off piece about twelve inches long and split diagonally from end to end, making two points. Split as though making for left-hand share. This leaves the right hand side high. Forge the high edge over until the scarf is formed, say 3-8 of an inch wide. Now fit the point to the frog of the plow bottom. If the bottom is worn, let the landside point extend below the bottom from 1-4 to 1-2 inch and straight or parallel with the bottom. Also straight on the side. If the frog of plow bottom is sharp where the landside scarf fits on, chisel off enough to let it fit up closely. Now clamp the landside on the plow bottom and be sure it is the right shape.

I now build up a good fire with green coal and by the time I have my shape fitted, I have a good fire to weld up. I fit any shape so that it will project over the edge of the landside point about 1-8 of an inch at the heel and flush at the point, and just a little straighter than the bend in the top of the landside point. When properly fitted drive on clamp so that the shape will fit tight all along. Take the share off the plow bottom and stand straight up in the fire flat on landside. Do not turn the share in the fire. I take the first heat at the point, but this is at the discretion of the operator. Do not get it too hot. I borax both sides. When taking from the fire be careful and not break down your fire and the first few

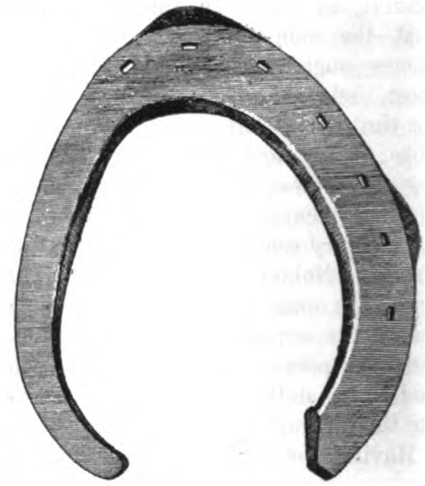


Fig. 14.—GROUND SURFACE OF SHOE IN FIG. 13.

blows; do not strike too hard, but rather slow and pressing blows until you see that the parts are stuck, then quick smart blows until the heat is gone. Then put back into the fire, after taking off the clamp and cover deep. Stand the share up straight and do not uncover or turn over to borax, as the borax will run down all right. You can watch your heat without moving the

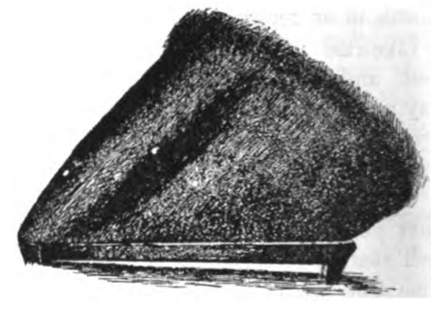


Fig. 15.—FORE HOOF SHOD TO QUICKEN ACTION.

Fig. 16.—HIND HOOF SHOD TO PREVENT FORGING.

share in the fire and when ready, take out on the anvil and proceed as with the first heat by sticking the top first, then turning over and welding scarf. For welding, I have a hammer with a cross pein long enough to reach over the widest part of the landside with which I weld scarf on the under side. Then hammer back the part that pro-

jects over the landside point and this gives you a nice high edge. I think the scarf a good thing, as it gives a weld fully an inch wide. Now see that the share fits and is true all around and double under your point and finish.

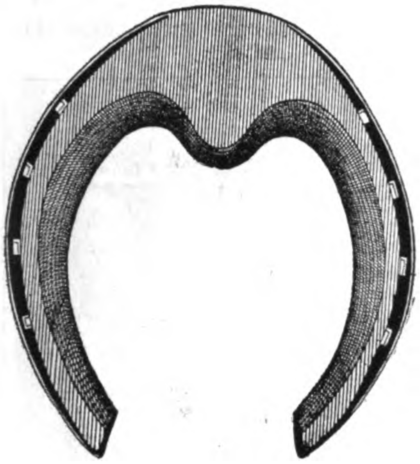


Fig. 17—A SHOE TO INCREASE STRIDE OF FORE FEET.

On new plows the edge of the share should be square with the landside plate the whole length.

I have been making nearly all the plow shares for twenty miles around Oberon, Kas., for the last twenty years as well as keeping them sharpened, so that I think you can find some information in the above article.

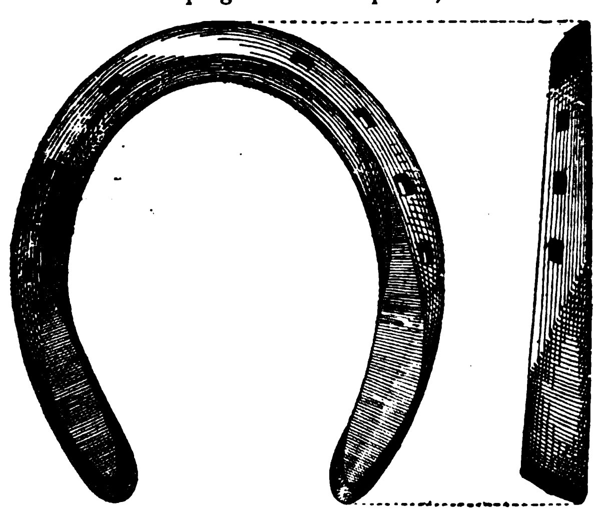


Fig. 18.—A HEEL-WEIGHT SHOE TO INDUCE HIGH ACTION.

Some Prices From Montana.

W. T. GILMER.

Horseshoeing, set of four, new....	$2.00
Setting four old shoes...........	1.50
Neverslips, new, four...........	2.50
Buggy tire, set of four...........	4.00
Wagon spokes, each............	.40
($1.00 extra for setting tire.)	
Felloes, each..................	.45
($1.00 extra for setting tire.)	
Wagon bolsters.................	4.50
Wagon sand bolsters............	4.00
Wagon tongues	$3.00 to $5.00
Wagon axles...........	$7.00 to $7.50
Wagon reaches.................	3.00
Plow sharpening...............	.50
Plow pointing..................	1.50

Treating a Badly Torn Hoof.

FRANZE WENKE.

Last month a very fine wheel-mule of a six-mule government team, got her shoe caught in the railroad track. The shoe having been on about 3 weeks, was very tight. Disengaging the foot, the mule fell, wrenching the shoe off, and also the wall of the hoof, from the third nail hole on the inside, to between the second and third nail hole on the outside. The hoof was torn clear off the sensitive laminæ, exposing the coffin bone, as much of it as a silver half dollar, but, remarkably, left the whole sole up to the white line. The mule had to march 17 miles the same day, before coming to the post.

The next morning I took hold of her, and with a hose and cold water reduced the inflammation. I then packed the sore with oakum and a solution of corrosive sublimate, 1–1000, and put on a leather boot. I noticed at the same time that the mule sprained her leg from the knee down to the fetlock, and especially the suspensory ligament was swollen the whole length. After continuing the above treatment twice daily for three days, I put on a bar-shoe with Neverslip caulks, but let it bear only from the heels to the fourth nail hole. I put a heavy piece of felt under the shoe next to the hoof. In front of the shoe I put a three-inch high clip, made out of a piece of stovepipe, fastened with three small screws to the shoe. I then packed the sore again with oakum, but used pine tar in place of corrosive sublimate. On the sprain I used a liniment, composed of 8 oz. Olive oil, 4 oz. turpentine, 4 oz. ammonia, 2 oz. tincture of opium and 1 oz. of gum camphor. For the first three days I had to water the mule with the bucket, but after that could lead her out to the trough. In about two weeks I expect to take the felt out and substitute only a thin layer of leather. During the first three days, I had the mule fed nothing but bran mashes and her drinking water had a tablespoonful of nitrate of potassium (saltpeter) to the bucket of water, so as to keep her bowels open. This feeding and watering, I do now every third day. The lameness almost disappeared altogether, and in two months she'll be ready for duty again. The mule weighs 1,600 pounds. I believe cleanliness, not too much interference, and open bowels, to be the most essential treatments in such cases.

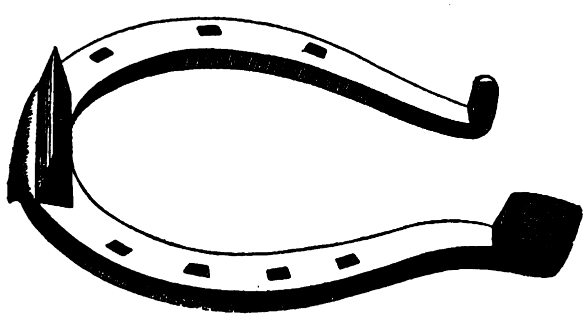


Fig. 19.—AN ICE SHOE FOR A ROADSTER.

Forging Gaffs For Game Cocks.

THOMAS J. GOOGERTY.

I will try and explain how to forge a set of gaffs for game cocks. Of course, there are many kinds, so I will confine my explanation to one kind only.

The first thing in order is to get some good tool steel, as it does not pay to use anything that is poor. Avoid overheating and use a slow blast so you get a uniform heat. See that your fire is free from sulphur and use plenty of coke on it. Harden at as low a heat as it will stand; results will be better. Take a piece of Jessop's tool steel, 3-4 inch square or octagon; take a heat on the end of a piece and fuller it on three sides about 3-4 of an inch from the end (note A of Fig. 1). Now, draw it back from fullers and square it up to about 1-2 inch; take a heat on the end and set on outside corner of anvil and work it up round and high, say about 1 inch high and 5-8 of an inch round, and draw the shank out small and round close to socket and cut it off so it will look like Fig. 1, B.

Now, anneal the piece and take it to the drill press and drill a 1/16-inch hole, or any size you may desire, through the socket. It should now be ground or filed down to a scant 1-16 of an inch around the hole.

You may now take a flat file with the edge 1-16 of an inch thick and file a slot crosswise 1-4 inch deep and draw the shank out as shown in Fig. 1, C. Next, heat this slotted end of socket and, with a small ball hammer, pein it over the point of horn so it looks like D.

Now, we will heat it by placing this turned lip in fire; when hot set it on anvil with lip up. We will now take a punch with an end ground short like a center punch and set it in hole of socket, and with a light hammer strike the tool with quick rebounding blows, turning tool as you strike; also strike the lip with

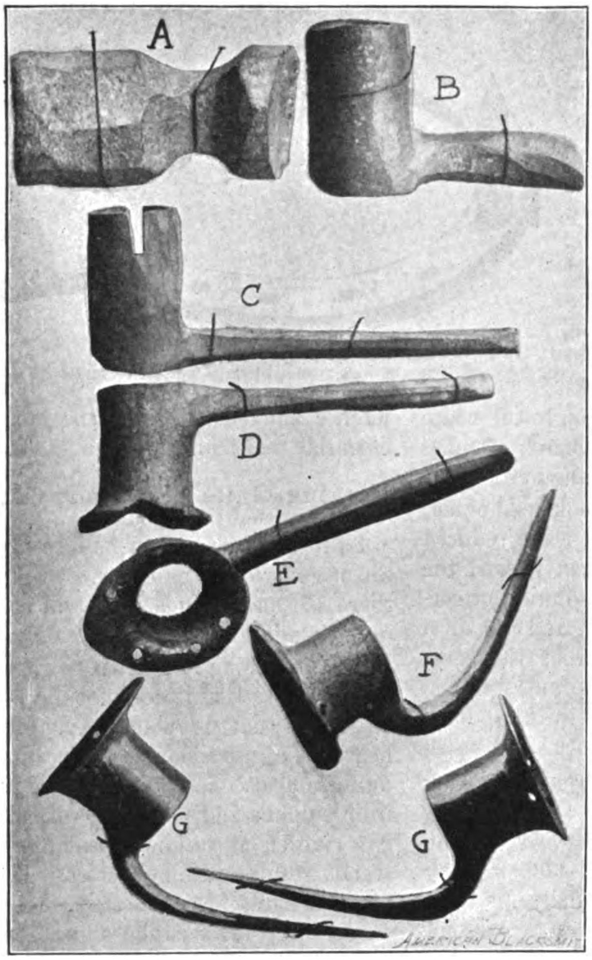


Fig. 1.—METHOD OF FORGING GAFFS.

hammer once in a while so as to get lip wide and flat. In doing this, care must be taken so as to have heat on lip (note Fig. 3).

When this is done, the socket will be about 1-2 inch high instead of 1 inch, as we started with. You may now take a file and dress up edge of lip, and also drill 6 small holes in it to sew the leather on and it will now look like Fig. 1, E. Now, draw the spur out and shape it up so it will look like F, or any shape and length you desire to make. It may now be filed to right size and all finished up except point, which ought not to be sharpened until it is tempered. Give the spur a graceful taper from socket to point, without any kinks, and when it is finished it will look like GG, in Fig. 1.

To temper them, I will say to have a good charcoal or well burned coal fire, so that the sulphur is well burned out. Take the well burned pieces and tap them down in center of fire till you have a nice bed of coke with an even heat all around the center of fire. Take hold of spur by socket with a small pair of tongs, and without blowing, have fire very little hotter than you want to make spur. Move it around and coax

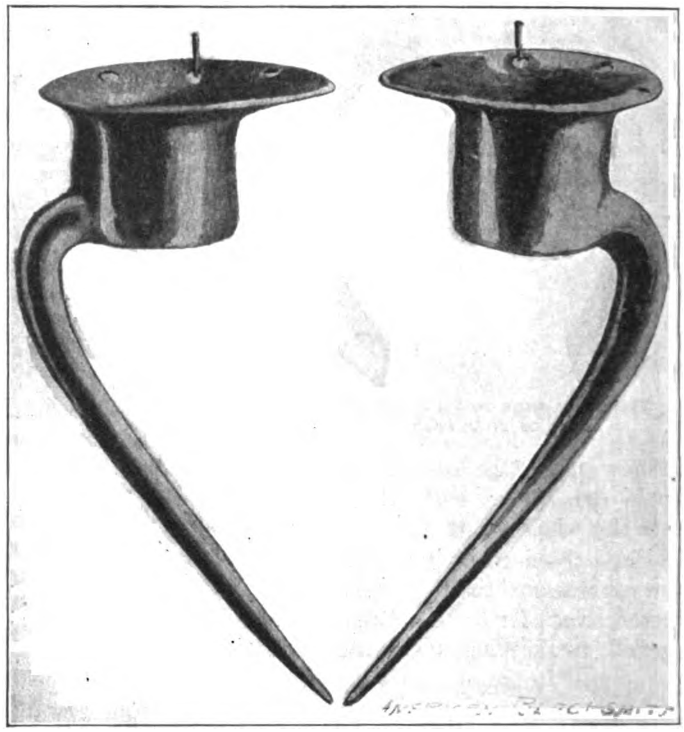


Fig. 2.—THE FINISHED GAFFS.

heat into spur slow; as low a heat as it will harden is right—a low red. Have a cup of oil on edge of fire and dip spur into it until cold.

Now brighten it off. The brighter the better (see Fig. 2). Take a little oily waste and rub on spur and draw it on a hot iron or hot sand until it is about a dark brown color and lay it away to cool. No fixed rule applies to this. It is a matter of skill which comes by use. The spur may now be ground to a point and polished and the leathers sewed on, and they are ready for execution.

An Axle Tram for the Repair Shop.

O. S. S.

The accompanying sketches show my kind of an axle tram for the average repair shop. It is very handy, easily made, and inexpensive. First make a trestle so as to stand about three feet high, of a length to take the longest axle used. The left hand end of the axle (B) rests in the crotch (C), the crotch sliding in the arbor (D) for different lengths of axles. The crotch has a nut on the under side to hold it in place. The right hand end of the axle rests on a gage (E), the left hand end of which works on a hinge, so as to raise and lower the other end, to suit the set as desired. The right end is adjusted by a screw bolt passing up through the end of trestle under the gage. The end of the trestle has a slot for the end of gage to work in. There is a ½-inch pin (G) at the collar upright in the trestle, and also a movable post (H) in same at the point

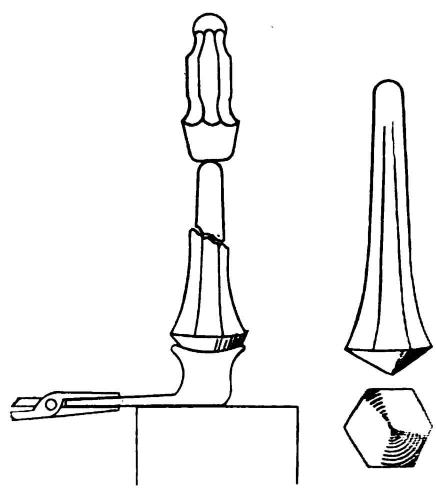
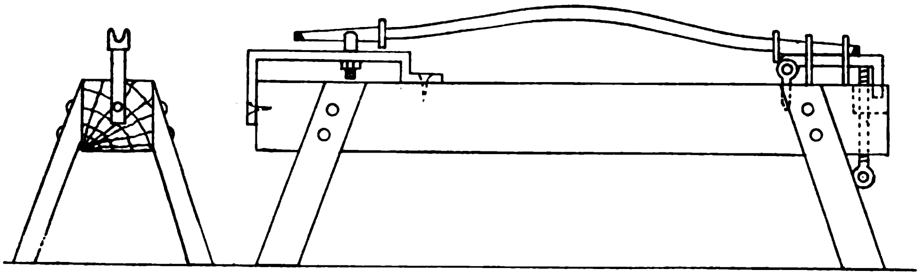


Fig. 3.—TOOL USED IN SHAPING GAFFS.

of the spindle to give the gather. To set the tram for use, stretch a line from crotch to gage and adjust the set bolt (F) to suit the set desired. Then move post (H) to or from the axle point to

suit the gather and you have it, the set and gather both at one time.

This device will be found very handy



AN AXLE TRAM FOR A REPAIR SHOP.

and for the general repair shop is the thing for setting axles quickly and easily.

Advertising the Smith Shop.

Advertising is, today, one of the chief elements of business. Every business, large or small, must either advertise or fall behind. Blacksmiths will derive benefit from a neat card or circular, or, better still, something with their name on it which the receiver will retain. The first of the year (not far away) is the best time to get out such a souvenir. For instance, an attractive calendar, with your name printed on it, given to your best customers and those you wish to have as customers, will help you and your trade wonderfully.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

A Case for a Veterinarian.—In answer to Inquirer, Canada, will say, you can't cure your horse by shoeing. Better send him to a competent veterinarian. W. B.

Screw Bit and Elliptic Spring.—Will some brother craftsman tell me how to put a screw bit on a ⅝-inch auger that has been broken off? Also how to make the joint of an elliptic spring. S. A. Carter.

Welding Landside Bars.—Will some brother blacksmith tell me how to weld landside bars to plow points successfully? I have trouble with mine. Jacob Varner.

Mixing Clay.—Will some brother smith let me know through these columns how to mix clay for the forge so it will not burn out every few days? Something to which the cinders will not stick. A. H.

A Criticism.—I think prize article on "Wagon Building" in the May number is not quite right on axle setting. This says that the wheels are to be a half inch wider on top when loaded than on the bottom. I wonder where he gets his plumb spoke? The grease would run out at the back of the axle. A. H.

A Shoeing Question.—I would like to ask some brother smith through these columns how to shoe a horse to keep him from dragging his left hind foot. Can I shoe to prevent it? Frank Kummer.

Water Wheel to Drive Blower.—Otis Geding asks if a six-inch wheel will run a blower for one fire. Will say that your wheel is plenty large enough judging from the power you get from your 17-inch wheel. O. B.

Drilling Moldboards.—In answer to Mr. J. B. Jex as to how to drill moldboards, would say, heat the moldboard to a cherry red, cover with sulphur and bury in the forge, then drill. M. F. Raby.

A Compound for Welding Shovel Points.—I find that by mixing five pounds of Cherry Heat with about two pounds of borax you can secure a very fine compound for making a perfect weld on shovel points, leaving the shovel clean. Mueller & Co.

Hanging of Bellows.—I would like some brother smith to give me an idea on how to hang up a bellows overhead with the best results, and the easiest way to work them, as I have changed mine from the forge to overhead, but they do not work as well as they did. William Lane.

Tempering Rock Drills.—Answering Mr. Craig's question as to tempering rock drills will say, when you are ready to harden your drill, heat to a cherry red, cool in water, not too cold, and watch for temper. When it is yellow, cool it off, but not entirely, by taking it out of the water before it is quite cold and allow to cool slowly—this will make drills tough and hard. W. O. B.

Prices from Mississippi.—The following are some of my prices, as I have not seen any as yet from Mississippi:

Horseshoeing, per pair	$0.75
Resetting shoes, per pair	.50
Setting wagon tires, up to 1½ inches, a set	2.50
Setting buggy tires, up to 1 inch, a set	3.00
Wagon axle thimble skeins, up to 2¾	2.50
Filling wagon wheels, spokes, up to 2 inches	3.50
Wagon tongue, up to 4 inches	2.00
Sharpening steel plow points. $0.10 to	.15
Sweeps, up to 12 inches	.10

My shop is 22 by 64 feet, and have almost every hand tool that I need; a good drill, spoke tenoning machine, and tire setter and bender. I am in a good farming district and have a good business. I would like to see more smiths write on every-day repair work in the columns of The American Blacksmith. M. M. Dendy.

A Few Questions.—Will some one tell me how long a galvanized pipe will stand in the ground without any water or steam passing through it before being rusted away? Which will rust the faster, mild steel or iron? Also, which is better for artistic iron work? Will the mild steel stand the wear from the weather better than the iron?

I would also like to have some brother smith give plans as to how to make a four horse evener for a sulky plow and what material to use, etc. Hans Hanson.

A Useful Board.—I find the following very convenient in my work, and perhaps some brother blacksmith may care to make one also. Take a small scrap of good plank and bore holes with good, clean cutting bits from 3-8 of an inch up, numbering each hole accordingly. Hang this up handy to your wheel repair rack and by using it you will save time in determining what size bit to use in boring felloes. Use the board on the old spokes. M. A. Sharp.

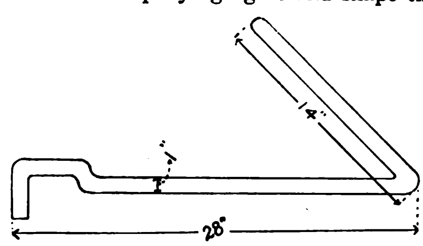
A Hardening Compound.—Will some one tell me, through these columns, of a compound which will harden plow lays? Perhaps some brother knows. H. Strottman.

In reply, will say take 15 lbs. of saltpetre, 2 lbs. of colophony, 7 lbs. of ferrocyanide of potash and mix well in a mortar. The steel to be hardened is heated to a dull red and sprinkled with enough of the powder to make a sort of glaze and then heated to the hardening temperature and cooled in water. W. O. B.

Shoeing Crooked Feet.—Answering Mr. McKeever's question on how to shoe crooked feet, will say, when preparing the hoof for the shoe do not touch the knife to the steep wall, but cut only the oblique or long wall away. A bar shoe is of advantage. O. B.

Hardening Concave Shell.—In answer to Mr. Emig's question how to case-harden a concave shell made of malleable iron, would say a thin film of surface hardening may be obtained by heating the iron red hot, rolling in powdered yellow prussiate of potash and quenching in water. W.O.B.

A Little Anvil Kink.—Bend a piece of iron to the shape and dimensions shown on the accompanying figure and shape the



A HANDY DEVICE FOR THE ANVIL.

shank to fit the hardy hole, and you will have a handy little device to attach to your anvil, which may help you some day to hold your iron for swaging purposes. C. C. Henderson.

Tire Setting Over Steel Wheels.—In answer to the question as to how to set tires over steel wheels, I must say that I have done a great deal of this class of work and for my part would rather tire a wooden wheel than draw a new tire around a steel wheel. A month ago I was called upon to draw a 10-inch over a six-inch, as the tires on the stone puller, on which they were to be used, were too narrow. Of course, such a tire I could not bend, so I ordered them from the wheel factory rounded and welded; 10 inches by 1-2 inch and 49 inches in diameter, each tire weighing 175 pounds. After I had the tires on the wheels, each wheel weighed 433 pounds. I advise all smiths when work of this kind is to be done to do it very quickly, as the outside tire will heat the inside one, causing

it to expand while the outside one is shrinking from the cold air striking it.

H. STROTTMAN.

Shoeing a Forger.—In answer to Mr. Stowe, who asks how to shoe a horse that forges, would say, shoe in front with shoes having a short rolled toe and with heel calks inclined forward; see that the shoes are no longer and no wider than the hoof.

On the hind feet put shoes with a toe calk only and see that the toe of the hoof projects slightly beyond the shoe.

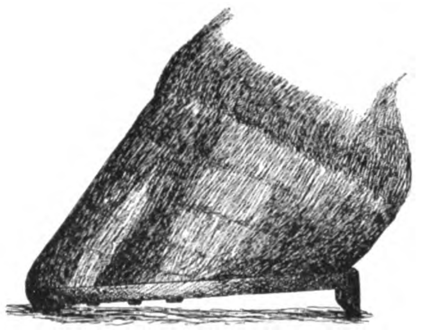
In welding axle stubs the best way is to lap weld and if the ends have been upset enough you will have enough stock to draw down on and have axle of proper length; if properly done, you will be unable to tell where the stub is welded. O. B.

An Appreciative Letter.—Some time ago the question was asked by the editor "How can we make THE AMERICAN BLACKSMITH better?" It is good enough for the money, but if we could get more interesting information, enlarge the paper and pay more for it, I think it would be more profitable for all. I have taken mechanical papers that cost double and were not half so good. I could not do without THE AMERICAN BLACKSMITH at double the price, for I think I get my dollar's worth from each copy. Here are some prices from Brown Co., Kansas:

Horseshoeing, new shoes, per span	$3.00
Resetting shoes, per span	1.60
Sharpening plows	.25
Sharpening discs, per blade	15 and 20c.
Wagon tongues	2.00
Buggy and carriage tongues	2.25
Buggy shafts, each	1.00
Filling wheels	$3.00 and 3.50

Terms on credit. M. A. FOSTER.

A Lame Horse—In reply to Mr. W. A. Craig's question as to how to shoe a horse that is lame (apparently in the cords), would say, it has been my experience for



SHOE TO RELIEVE STRAIN ON CORDS.

over 20 years to fit a shoe without toe calks, making the heel calk about ¾ of an inch long and only sharpening one-half of it. The figure shows the shoe and the calk and how it is to be sharpened. Sharpening the calk in this way will let the foot down easy, raise the heel high and take the strain off the cords, and relief will soon be apparent. The trouble is, the toe has not been pared off properly; this raises the toe and lowers the heel and brings a strain on the cords. I would like to hear from Mr. Craig after he tries this. C. W. METCALF.

Stake Straps.—The young craftsman will find the following hint on making stake straps to be cheaper than cast straps, especially if he has many to make. I can make one at two heats and punch hot, or at one heat and punch cold. I use steel ¼-inch by 2½-inch and cut my stock nine inches long, heating a good steel heat. I next lay it on the square part of anvil and turn down with good square corners, turning over on the face of the anvil to shape up the end and punch for bolts. That gives a good shape for your stakes. I set mine up square 1½ inches by 3½ inches inside. W. L. CAWTHON.

Hardening Plow Shares.—We noticed in a recent issue of THE AMERICAN BLACKSMITH an inquiry from one subscriber, "Jack," asking how to harden plow shares and obtain good results. We believe if the following method is carefully carried out, the result will be found entirely satisfactory:

It is necessary to have a bath of clear soft water with sufficient salt to make a very strong brine. First heat the landside point from the under side, until a good bright red heat is obtained, then put in and heat entire share, heating up very slowly and be sure to heat evenly (success will depend largely upon this). Then bring to good dark red color and plunge in your bath, moldboard edge first.

We think that this treatment, if carefully followed out, will bring good results and we trust "Jack" will give it a test.

STAR MANUFACTURING CO.

Removing Dish from Wheels.—With regard to taking dish out of wheels, would say that I made a tire frame out of ½ by 2-inch stock. I cut the tire iron for this 9¼ feet long, bent it perfectly round, level welded it nicely, and put four holes in it at equal distances. Next put on four legs 14 inches long, with strong cross bars at the bottom. Make the bolt long enough to go through this frame and the hub of a wheel. I take the tire and rim off. After getting off all of the paint I can, I sandpaper the spokes and soak the wheel for about 36 hours in good, clean water. I then put the wheel on the rim stand and screw it down to a little below straight and dry it out by the fire. You can build a small fire under the wheel as the frame is all iron. This will not hurt the frame, but you must be sure not to scorch the spokes. I can take the dish out of the spokes, put the rim and tire on and warrant it to stand as good or better than a new wheel. I always repaint them. As I do my woodwork and iron work I know exactly where all the faults are and can always make a success of it. I am of the opinion that all smiths should know something about woodwork, having some knowledge of the strength of wood, its nature, etc. JOHN H. HILL.

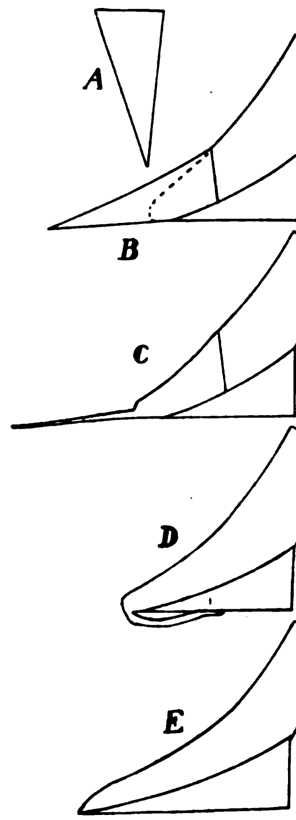
A Letter from New Mexico—I have been in the blacksmith business out West for 19 years, where our only customers are cattle men. As a rule, we have to keep running accounts until the manager comes to town when the bill is paid in full, sometimes amounting to $100. The following are some of our prices:

Four new shoes	$1.50
Resetting old shoes	1.25
Setting buggy tires, each	1.00
Setting wagon tires, each	.75
Wagon axle	4.50
Tongue	4.00
Sharpening 12-inch plow	.25
Stamp irons for branding stock, per each letter or figure	$1.00 to $1.50

Piedmont coal costs us $29.00 a ton laid down here, iron five cents per pound, while a helper charges $1.50 per day. I have a good shop with two forges, being the first in this part of New Mexico. W. E. TIPTON.

Spring Welding—I would not advise any one to split a spring for welding. If it is split once there are four laps to be welded down, not to mention welding the split. A long experience has taught me that the welding heat should be taken with the ends separate in the fire, and taken out and welded up in one heat. There are two or more good reasons for not riveting or splitting a spring leaf, one of which is that when the ends which are riveted or splits lapped are placed in the fire for welding heat, there are two thicknesses of steel to be heated where the lap is, while there is only one thickness at the ends of laps. You can therefore see that the single thickness will suffer while the double one is acquiring a welding heat. It is therefore important to try the separate heat process and as there is no appreciable waste of steel in welding, it is unnecessary to put a piece in it. RICHARD O'HEARN.

How to Repoint a Plow.—As I have not seen anything on plow work, I will give my method of pointing a plow, as this work is in season now. In the illustration herewith, A represents the lay, which, when cut out, should be long enough to draw out the bar, according to the size of the point which is to be laid. Draw the top of the lay to a



METHOD OF REPOINTING PLOWS.

feather edge. B represents lay welded on top of point; C, the bar of lay drawn out; D, the bar turned under ready to weld; E, the job when complete. I find this the most successful way to point a plow. If some brother smith, however, has a better one, let us have it. E. P. KILLGORE.

A Minnesota Letter.—The following will give an idea of the prices in this part of Minnesota:

Plow lays, 14-inch	$3.50
16-inch	4.00
18-inch	4.50
Sharpening plow lays	.25
Hardening plow lays	.25
Polishing plow lays	.20
Painting plow lays	.50
Horseshoeing, per shoe	20 and .40
Horseshoeing, steel plugged	10 extra
New wagon poles	$2.00 to $2.50
Buggy poles	2.50
Tire setting	.50
Rims, per wheel	1.30
Spokes	15 to .25
Machine work and lathe work, per hour,	.50

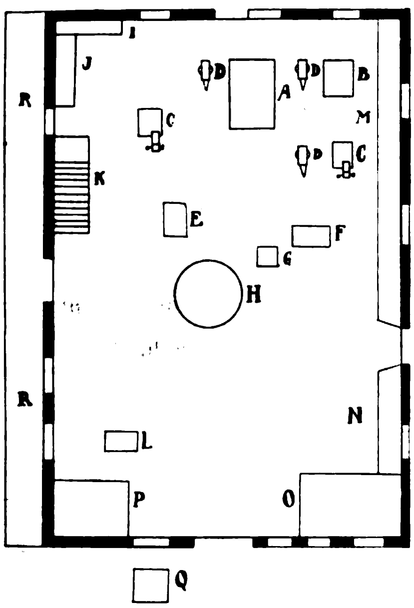
I have a four horsepower White gasoline engine, a Little Giant trip hammer, a blower, emery stand for grinding and polishing, drilling machine and turning lathe, a shear for cutting iron bars, a tire bender and a tire shrinker. I made, for myself, a band saw with 30-inch wheel, also a two-spindle shaper and a boring machine for boring wood and cutting tenons on spokes, etc. I bought a Reynolds tire bolter a few days ago, which I am well satisfied with.

The following is the way in which I made my band saw. The frame is of 6 by 8 inch pine: oak is better, however. I took new buggy wheels and cut them down to the size I wanted the wheel and put on a 1 3-4 by 2-inch bent rim and turned it down until true. I lined it with rubber belting and babbitted the wheel in the hub for the shaft.

I made the frame of the shaper out of 6 by 6 lumber and took an old shaft and made the spindles. My spindle is two inches and at the collar it is 1 1-2 inches thick. I then obtained different sized knives up to six inches long for planing planks, etc.

My shop is 24 by 52 feet, with three fires. I have two helpers. ALBERT MELLUM.

Shop Lay-Out—The diagram shows the shop of Dillard Bros., Bartlett, Texas, the dimensions of the building being sixty feet



PLAN OF A TEXAS SHOP.

long, forty feet wide, and one story and a half high. There are double doors in front, with a roller door on each side and in the back.

A. Indicates double forge run by power blower.
B. Hand forge with blower.
C. Large iron vises.
D. Anvils.
E. Punch and shears.
F. Surface and face emery stones.
G. Power drill press.
H. Henderson tire setter machine.
I. Bolt case.
J. Rivet case and small bolts.
L. Large grindstone.
M. Large rod and bar rack.
N. Wood bench.
O. Engine room with 5 H. P. Foos Gasoline Engine.
P. Coal bin.
Q. Rip and cut-off saw.
R. Full length shed for horseshoeing. Also other tools. D. W. MURPHREE.

A Sick Horse.—I have a horse that has a lump on his throat caused by using a breast collar. I cannot now use any collar on him, unless so large that it will not touch his neck. He has also a cough, and nausea. He is in good condition otherwise. I have put him to pasture, but he is not gaining. The lump is where the collar strikes the wind pipe. I would like to get the horse cured before harvest, so would like to hear of a remedy. JESSE HANSON.

In reply. Would say apply a warm poultice of linseed meal or wheat bran to the lump on the throat, renewing it daily until the center of the boil is soft, when it should be lanced or cut, and the matter pressed out. Be careful to keep the wound clean and free from irritation. Then bind the wound with cotton wool or lint saturated with carbolic acid and water, ½ oz. of carbolic acid to one pint of water.

The cough and nausea you speak of are very likely symptoms of sore throat. Place the horse in light airy stall, give plenty of fresh air and blanket the body. Hold the horse's head over a bucket of boiling water so that the animal must inhale the steam. Stirring the water with a whisp of hay will cause the vapor to rise in great abundance. Put a tablespoonful of turpentine in each bucket of water you use.

Feed only soft food, such as bran mash, linseed gruel, scalded oats and, best of all, fresh grass. See that the animal has plenty of fresh water at all times and keep out of drafts. WALT.

Spokes and Tenons.—Replying briefly to Mr. Wenke and others, I wish to be thoroughly understood in the matter of dressing off the end of a spoke tenon. When I say "shallow gouge" my meaning certainly should be plain enough. To shallow gouge is to trim off with a flat gouge any of the tenon that may protrude above the surface of the rim. The gouge is better than a chisel because it will remove the center of protruding part and bring it slightly below the surface, but not enough to permit the tire to rest wholly on the rim without also resting on the spoke. Between the extremes of allowing any part of a spoke to protrude above the rim and of cutting away too much, there is a certain proper point at which to stop and any carriage smith should know that point.

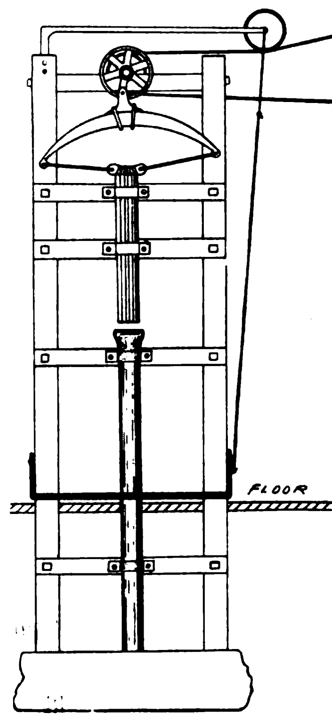
In order that no young smith who reads this may doubt my experience, whatever doubts he may have of my skill, I wish to state that I have been 30 years at the trade, serving three years as an apprentice in a shop where we forged all our irons and received from $300 to $350 for our buggies. We built the old-fashioned high wheel sulkies,—built them to fit the horse,—some of them not weighing over 42 pounds when painted. Some 22 years ago, when working for Warden & Wright, of Cleveland, we stopped giving gather to our axles. Gather was then considered an "old fogy" idea for city vehicles, although for the country ¼ of an inch gather was considered good. To Mr. Foster, who recently said that he had worked in six different States and this was the first time he had heard this subject disputed, I would reply that I have worked in 16 different States, in Canada and in the Old Country, and have been foreman in a number of shops.

Don't wedge spokes in rims with nails. Use factory wedges. There is not much required of a wedge and the average factory wedge is as good as you can make at home in the winter. R. O'HEARN.

Home-made Power Hammer. — Herewith is an illustration of a home-made power hammer, as some brother smiths have been inquiring about one. I made one for myself and it works satisfactorily.

First, I took lumber, two pieces, 8 feet long, 4 by 6 inches, four pieces of 2 by 2 by 20 inches, and one piece 2 by 6 by 12 inches, which I use on top to hold the boxes and shaft for a Pitman wheel. After I had the frame ready I bolted on the shaft—an engine shaft weighing 70 pounds. This I use for an anvil, and the hammer I have is 3 by 3 by 24 inches.

Next I attached the spring, using a four-leaf buggy spring, two inches wide and 20 inches long. Then I took a Pitman wheel from a harvester, 6-inch stroke. I put this



A HOME-MADE POWER HAMMER.

in place, and on the drive pulley I put rims, so that the belt could not slip off. Then I made the Pitman rod the right length, so that when raised it would not catch the cross braces, and when lowered there would be a space of about one inch or less between the anvil and the hammer. Then I fitted on a belt tightener and ran a rod down to the floor, for a foot lever, when setting it. I used heavy rock for a foundation and braced it to the ceiling or walls. I can set it in the ground to have it the right height to be easy to operate. It should not be too high.

I used to work with a power hammer before I made this one for myself. A person can do fast work with them, especially on plow lays or cultivator shovels. The pin or hammer, a blacksmith can sharpen to suit himself. About the spring—after it is made, couple it with the hammer. Straps ¼ by one inch are strong enough. I punch the holes in the hammer, close to the edge and use ½-inch bolts in spring and hammer.

I have something to say about THE AMERICAN BLACKSMITH. It is a great help to any blacksmith, for it illustrates anything good for the craft's help, and I would not be without it as long as I stay at blacksmithing. JOS. VANEK.

Cold Tire Setters.—With regard to William Darling's question as to cold tire setting machines, would say that my experience has been as follows:

When you put the wheel in the tire setter and apply the pressure, it is so great that it presses the wheel up in the middle and grips the tire on the bottom edge only. Some tire setters have a rod to hold the wheel down. You must drive the spokes in the hub and felloe far enough to fill up the tire, because it will spring back considerably after the pressure is taken off. A brother smith recently told me that when he set a tire he gave it ¼-inch dish, then took off the tire from the wheel and measured both tire and wheel, finding the tire ¼-inch larger than the wheel.

Cold tire setting works all right on the old wheels that are lying behind the shop. I tried cold setting on some wheels and in two days the wheels were back and rather than lose a good customer, I set the tires again.

Now the edge grip tire setter is different. It pulls the tire thin in two places and makes it thick in another. The edge grip tire setter also is hard on the welded places.

Of course, I do not condemn all tire setters, but my advice is that you buy a good hot tire setter and hold on until the tires are invented that set themselves. Old wheels nearly always need wedging up, and after you have the tire off you had better heat it right, and that is hot. I believe in machinery and improvements if they are the right kind. AUGUST RUNGE.

Some Illinois Prices.—A great deal has been said about organizing and advancing prices. As we are getting fairly good prices, we do not feel the necessity of it, but for the benefit of all in the trade, I am in favor of it. If smiths are shoeing for 15 and 25 cents and sharpening plow shares for 15 cents, as given in a price schedule from Indiana in the May issue, it is certainly time for something to be done. Without doubt, a man must be the best smith in the town in order to be able to obtain better prices than his neighbor craftsmen. When I came to my present location there was but one old shop and some old tools. The former smith said it was impossible to make it pay, because the custom all went to a shop four miles away, which had been established twenty-five years. Upon starting, I raised the prices to that of my competitor's and took my chances. The first year I made $625, and the past or fourth year, $1,400. Now I employ a helper and have work enough for both. This will show what honest work and fair treatment can do. I make new wagons, water tanks, repaint wagons, clip horses and do general work and never cut a price for any one, but warrant all of my work. The following are some of my prices:

Shoeing	$0.20 and $0.40
Tire setting	.50
New buggy tires, a set	5.50
" " rims	3.50
New wagon tires, 1½ x ½, a set	7.00
" " rims, 1½ x 2	5.00
New plow shares, 14-inch	3.50
" " " 16-inch	4.00
Sharpening plow shares, 14 & 16-inch, $0.40 and	.45
Sharpening pulverizers, per disc	.15
" cultivator shovels, four to set	.80
Sharpening cultivator shovels, six to set	.90

I harden and polish all shares and shovels. C. J. PETERSEN.

Carriage Work.—In regard to carriage, and wagon work, to make a success of it, first select your timber and when you use a piece of wood be sure that it is dry, if it is not, don't use it. When you cut a mortise, take pains to cut it true, i. e., to have your tools sharp and keen, and dress your timber smoothly and neatly. Five cents worth of sand paper sometimes will make a man dollars, if he will use first-class material and finishes it in workman-like manner. When a farmer comes in and looks at your work, he will say right away, "That man is a good workman," and will have some work for you at once. If it was rough, he would say, "I don't want any of that man's work," no matter how strong, nor how good material he had used in it. I have found in my work of 22 years past that first class work and good material are what give satisfaction to all. If an old wagon is brought in to be repaired, use the best wood you can get and finish it neatly. The first man who sees it will say, "Who did that work?" "Why, Mr. Smith." Then he will say, "He is a fine workman."

When you do a piece of work be sure everything fits neatly; there is too much putty used now-a-days to fill open joints. He may be ever so good a workman, but he may neglect to file his saw, or maybe it won't run true. To be a good mechanic a man must learn to get his tools in shape. You want your saw so you can lay a fine cambric needle on the teeth at the heel and it will run to the point without jumping off. Then you can saw a perfect joint. When you fill an old wheel, try and make it as near like a new one as possible. Get the tire the right size, so when it is set the wheel is not dished too much. When you paint a new piece of work, use a good filler of white lead and oil. Don't use cheap paint because you want to make all the money you can. Use a good filler and rub it down. Use any color you wish and it will stay. You will find with a little experience that my theory is right. It may cost you a little more at the time, but you will gain it all back afterwards. You may have to employ more men to wait on your customers, but in a short time you can act as foreman, give orders, take orders, and make money by doing so. C. W .METCALF.

An Interesting Letter.—I am operating a shop 40 by 46. My Watkins, two-horsepower gas engine runs a trip hammer, band saw, two emery wheels, forge fan, large enough for six fires, one ventilation fan, and drill press. My trip hammer is the "Easy," made by Mayer Bros., Mankato, Minn., and I would recommend this, together with the Watkins gas engine, to any smith contemplating putting these machines in his shop. I run my shop alone most of the time and find that I can do more work of most any kind with my engine, than I could without it and a helper, and with more satisfaction to my customers.

In putting on new tires, I lay my tire down, run the wheel on it to get the length, allowing two thicknesses to weld. I then cut it off cold and bend it, place in the fire and heat both ends at once. After scarfing, weld at one heat. To punch holes in the tire and rivet them together is all lost time. I have made one tire ⅝ by 1½ inches, for a 3½-foot wheel out of straight bar, welded, put on, drilled four holes and nailed it on in 32 minutes. The same holds good for buggy tires with the exception that when I scarf, I split them on my hardy about ½ inch, open and push together with staver, take heat and weld. You can do this at two heats. While working by the day, I put on four new rims and four new spokes, rounded up the rims and made four new tires, putting them on to drill, buggy wheels and spring rims in five hours. My partner made two ⅞-inch buggy tires and had them on in twenty minutes.

In resetting buggy tires, I use a four-leg wheel trestle, ironed on top, lay my wheel on it, mark at point, and then taking a thin chisel, cut down between the tire and rim and cut off the bolts. Never take them out, as it does not pay. Buy them for $1.40 per thousand. I heat the tire between the holes and stave on a Lancaster staver, reset the tire, place it on wheel, stool and bolt down. Drive in the new bolts, using the Green River rim wrench with brace. I keep the crank wrench but the brace is much the quicker. Last season I set four tires in forty-seven minutes. They were bolted in every two spokes. It takes a little longer when full bolted.

Some smiths try to get the two calks together when shoeing a horse. Every time they move they drive the heels together. Now, I try to give the frog room to grow and let the dirt get to it. When I calk the shoe I turn my calk and lean it out the width of it on the outside. Of course, you cannot do this on the inside on account of interfering. That is easy to fix, if you level the foot so that the horse steps straight. It is a wrong idea to turn the calk in on the frog to keep from interfering. Get the foot level and they will not interfere. I have worked at this for thirty years and have no trouble with interfering. This can be prevented by paring the foot. Sometimes you get a short foot which cannot be pared, so that the shoe will have to be fixed, making it thick or light on one side or the other, just as you think best. I do this only when I have no foot to pare. I took off two pairs of shoes recently that only measured 1¼ inches between the calks, No. 3 and No. 4 shoes. You can imagine their appearance. A. M. SPEER.

A Louisiana Letter.—I am a strong believer in every blacksmith writing something for his paper occasionally. If everybody sat back and waited for the other fellow to write, the paper would not be nearly so interesting. Everyone should lend a helping hand and tell what he knows, if it is only a little bit. If you don't know something useful to tell from your own experience, tell what you have seen some one else do, and if you never saw anything done, then ask the trade some questions and you are sure of getting some advice. If I know of it all I would not urge others to read journals, buy tools and improved machines and tell me their experience. I love new tools, improved machines and up-to-date shops, and I like to read our journals and look at hardware catalogues.

We have some smiths here who take great interest in other people's affairs, often to the neglect of their own work. They are the kind whose hammers are all hair-lipped, their punches made out of any old thing and scattered all over the benches and floor. If you say anything to them about taking a journal they will tell you they don't need any such thing and have no time to read it. If they get a catalogue they only glance at it and throw it down like a patent medicine circular. You talk to them about power or a new tool and they say it won't pay, or it costs too much, or they can get the job out with their old hand axe while you are getting ready. I say that if a man can't make enough out of his business to keep everything up-to-date, to buy some machinery, take his trade journal, have proper printed matter, and run some ads in his local paper, he had better quit.

I think it all bosh about a man being able to do only one thing and do it properly. You can carry on many different kinds of work. In my shop I do turned work, scroll work, make anything in fact that they call on me for. Am now building a grocery refrigerator, six feet high, four feet wide, and 30 inches deep outside, with 5-inch walls. I get $35.00 for it, which is cheap, but I am simply making it on the side. Rather than take a shop without power in it as a gift, I would work by the day for a man that did have power. That's the way I feel about power in the shop. J. VESTAL.

THE AMERICAN BLACKSMITH

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An Advertising Opportunity.

The special attention of all readers of THE AMERICAN BLACKSMITH is directed to the announcement on page XIV of this issue. We believe the opportunity there presented will interest all who own or run shops, and who are quick to take advantage of good schemes for advertising their trade. Promptness in acting on the offer is recommended.

The Third Volume.

With this issue ends the third volume of THE AMERICAN BLACKSMITH. A carefully compiled index appears on the last two reading pages, giving in alphabetical order and arranged for easy reference, a list of all articles appearing in volume III, from October, 1903, to and including September, 1904.

Our constant effort has been to make the paper of greater interest and value with each succeeding issue, so that it is very encouraging to read the hundreds upon hundreds of letters that come to us from readers, saying that they like THE AMERICAN BLACKSMITH more than ever and that they would not do without it for many times its cost. Our friends who are readers can do us a service by calling the paper to the attention of their friends who are not readers, and by telling them we are always glad to send a sample copy free to any address upon request.

THE AMERICAN BLACKSMITH furthermore desires to thank its readers for their patronage in the past, and to assure them that it will be more than merited in the future. Arrangements have been made with well-known craft writers of wide experience to furnish articles for the coming volume. Its pages will, we think, be found of considerably greater interest than those of any preceding volume, and some new features are to be added to make them more attractive than ever.

What is Your Outlook?

Indications point to the Presidential election as causing much less disturbance than usual in the business activities of the country, due to the elimination of the money question and also to the fact that the result of the election is pretty much a foregone conclusion. With crop reports as favorable as they are, the prospects are bright for an early return of great activity in all lines of trade.

What is the outlook for the blacksmith and wagon-building craft in your vicinity? Has the past summer been a good one, and do you look for business to pick up this fall and winter? We should like to receive a brief note upon the above questions from our readers in every section of the country.

The Blacksmith and the Gas Engine.

The gas and gasoline engine, its principle and construction, and its utility for the smith shop, have been made the special feature of this issue. Those who have an engine will find in the following pages facts of interest regarding its operation. Those who have no engine are strongly urged to look at the question from the standpoint of those who have already installed power, and who tell of their experience in this issue. All readers are invited to ask questions upon any topic connected with gas or gasoline engines, and in fact anything connected with the shop and we will see that they are answered in future issues.

We are also glad at all times to put our readers into correspondence with reputable manufacturers of gas engines.

The Recent New York Strike of Vehicle Makers.

O. S. POAK, JR.

The remarks in the July AMERICAN BLACKSMITH relative to strikes, "Does the gain equal the loss?" is perhaps as pungent a question as has been placed before the public in many years, as the sequel will set forth in plain undeniable facts and figures. In New York City the locals of the International Union of Carriage and Wagon Makers of North America voted last April to demand an increase of wages and a decrease of hours. Such demand was made by the two English and one German-speaking unions, and the ultimatum was "strike." Before proceeding further, the writer wishes it understood that he is a workman, but has never been connected with any labor organization. He is in favor of trade organizations properly conducted. He simply wishes to give facts as they have occurred. The Association of Employers, composed of the leading vehicle builders of the city, met and adopted the following resolutions:—"We will not grant the demands about to be made by our employees. To insure good faith each concern represented shall deposit with the Association $500 security. Yielding to the union's demands means forfeiture of the deposit." The demand was not granted. The men went out, perhaps 4,000 or more. After a few days two concerns yielded. The remainder were obdurate. Brutality and rioting was on exhibition in a great many localities.

Then the forces of the strikers began to waver. Their savings were gone. The strike fund was soon exhausted. The backbone of the strike had collapsed. In bodies and as union men they made requests to be reinstated. Their request was rejected and this reply made—"Any of our employes wishing to be reinstated must make personal requests." The "requests" were voted down at the union meetings. One

by one and in pairs they deserted the union and applied on their "own hook." It is safe to say that not more than 60 per cent. have been reinstated. The "black book" system has been adopted by the Employers' Association, which is to be regretted, for the five weeks' loss of time, averaging about $12 per week per capita, was enough penalty to apply to those who had forgotten their own rights and benefits in accepting the edicts of the walking delegates.

In many instances the men had been advanced 10% a year ago. Those who have been reinstated are to go back to the old schedule. The time allowance "half day holiday" on Saturday remains. The trade (in New York) is not promising. One large concern remarked: "We can go on without making a vehicle, unless ordered, until January next and then have a surplus, unless trade makes extraordinary spurts." And there is the end of the strike. Vehicle builders, strikes in the Metropolis, history says, have ever been failures. Some employers say had the demand been for wages only by the men personally, it would have been favorably considered. The men conceded they have acted unwisely and rest the blame where it rightfully belongs, with the clamoring delegates who wanted to earn their wages.

The Gas Engine.—1.

Principle and Construction.

E. W. LONGANECKER.

In kindling his coal fire the blacksmith has many evidences of gas formation, as well as the quick burning or rapid combustion quality of it. Gas, when properly mixed with air, will flash or explode, if confined, when it comes in contact with an igniting spark or heat. This explosive gas may come from either a solid, as gunpowder, a fluid, like gasoline, or a vapor mixture. This classification is used here purely as an illustration. The word gas ordinarily signifies a vapor. But gas may be confined in many solids or liquids, and comes into evidence only when liberated or the solid converted by some chemical process.

The gas generally used for fuel in the gas engine is one of the various hydrocarbons, that is, a gas composed of carbon and hydrogen. Carbon exists as mineral graphite or black lead, and also pure charcoal. It readily unites with various gases, such, for instance, as oxygen. One atom or part of carbon and two of oxygen, represented by the chemical notation CO_2, is the incombustible carbonic acid, the gas you notice in soda water. But when the carbon unites with hydrogen we have a gas known as a hydrocarbon. The atoms of carbon and hydrogen may unite in such proportions as to form either a vapor or a fluid.

Benzine, a fluid hydrocarbon which is closely related to gasoline and produces practically the same results in an engine, is chemically known by the notation C_6H_6. Although gas in a solid combination is not used as a fuel in gas engines, it was the use of gunpowder in firearms which first suggested the idea. The fuels commonly used in this country for gas engines are natural gas, artificial gas, gasoline, naphtha, benzine and kerosene, all of them hydrocarbons. The last four are distilled from crude oil, which is found in many parts of the United States in rock 400 to 2,000 feet below the surface of the ground.

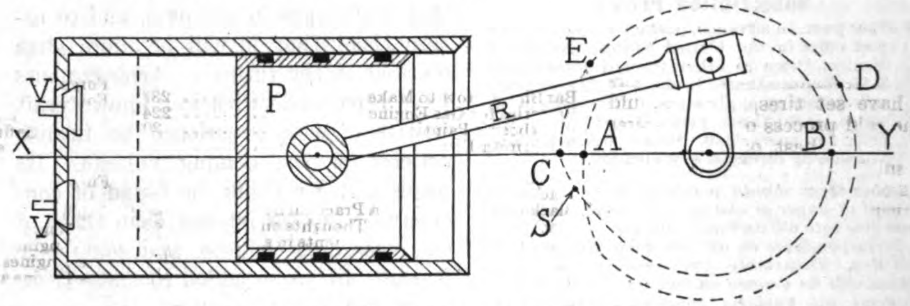


Fig. 1.—SHOWING THE PRINCIPLE OF A FOUR-CYCLE GAS ENGINE. *a* TO *b*, INHALATION; *b* TO *c*, COMPRESSION; *c* TO *d*, IMPULSE; *d* TO *a*, EXHAUST; *x y*, CENTER LINE OF ENGINE.

Though many engines sold to blacksmiths are referred to only as gasoline engines because gasoline is the fuel, yet in the real sense the engine is a gas engine because the gasoline fluid in mixing with the air changes to and is exploded as a gas. Many automobile operators refer to their gas engines as hydrocarbon engines. The owners of small pleasure boats call their power naphtha engines. With farmers and rural blacksmiths these machines are commonly known as gasoline engines. In the larger cities nearly all stationary engines of the hydrocarbon type are called gas engines, no matter what fuel they use. Any engine that receives a quantity of air, charged with some hydrocarbon gas, into its cylinder behind the piston, and there explodes it, is properly called a gas engine or hydrocarbon engine. Internal combustion and explosive engines are also names given to the gas engine.

As already hinted, the gas engine gets its power by exploding a charge of gas in the cylinder behind the piston. Exploding it is simply a quick burning of it. Hydrocarbon gas, when properly mixed with air, is highly inflammable and a quick burner, which gives it its explosive property. The intense heat resulting from this quick combustion or explosion causes a heavy pressure or expansion against the piston, which forces it with great energy on its outward movement. The piston is connected to the crank shaft by means of the connecting rod or pitman. The crank shaft carries the flywheels. The energy from the explosion is transmitted through the piston, connecting rod and crank shaft to the flywheels. The power in the gas engine is thus derived directly from heat, and the heat is applied directly to the piston by burning the fuel itself right in the cylinder behind the piston. This is quite different from the principle employed in the steam engine, which also derives its power from heat. Instead of burning its fuel directly in the cylinder, the heat from the burning fuel under the boiler is imparted through the walls and tubes to the water, which is converted into hot steam, which in turn is let into the cylinder behind the piston, and the expansion due to the heat it carries drives the engine. The gas engine draws its fuel right into the cylinder, we might say "in small chunks," burns each little "chunk" or raw charge, the piston deriving almost all the power there is in it, and then gets rid of the burnt gas in one or two revolutions of the flywheel, after which it is then ready to take another charge and repeat the operation. A whole day's running of a gas engine is simply a routine of taking into the cylinder one charge after another, extracting the power from each and applying it in successive impulses to the piston, and through it to the flywheels.

The gas engine must consequently be so constructed that the suction of the piston can be used to draw in the charge of fuel, or at least a portion of it. The air alone may be drawn in by the piston and after it is compressed the gas or real fuel may be injected or pumped right into this compressed air, the immediate explosion of which causes the

impulse. By far the most common practice, however, is to so construct the engine as to inhale the charge of gas and air together and to mix them on their way to the inside of the cylinder. No further pumping-in process is then necessary, but the gas is ready for explosion immediately after its compression is complete.

It has been found that the power results are much greater and much more effective if the charges are ignited or exploded under heavy compression. Therefore, after inhaling or drawing a charge into the cylinder, the next step is to compress it or to prepare it, as it were, for explosion. These two acts, the *inhalation* and *compression* of a charge require two movements of the piston, in the four-cycle engine. The inhalation requires the *outward movement* when the fuel and air admission valve is open. The compression of the charge is accomplished by the following *inward movement* with all the valves closed. These two movements represent one complete turn of the flywheels. The wheels, in other words, make one turn without an impulse. This is the *get-ready* turn. Just when the compression movement is completed and the piston is starting out again the explosion occurs, the force of which sends the piston on this outward stroke with great vigor. This is the *third* or *working* stroke of the piston. When the piston gets nearly to the end of this working stroke the exhaust valve opens to let out the burnt products and remains open during the next inward movement of the piston. This completes the process of producing one impulse in the gas engine. It takes four movements of the piston to do it, hence the name *four-cycle*. Hence a four-cycle single cylinder gas engine gets only one power impulse in two turns of the flywheels.

These four movements necessary to get ready and complete an impulse may be designated *four steps* of the piston, and named as follows: First step, inhalation; second step, compression; third step, explosion or impulse; fourth step, exhaust. This explains the principle upon which the four-cycle engine operates. The four-cycle principle is the one embodied in probably 95 per cent. of engines used by American blacksmiths. The illustration, Fig. I, will serve to assist one in getting a full understanding of the four-cycle principle. The dotted circles in the illustration are intended only to represent the first and second revolution which an engine takes to complete one cycle, the inner dotted circle representing the first and the outer the second revolution. The first half of the first revolution, as a point on the crank moves from A to B, represents the suction, take-in or inhalation stroke. The admission valve is open, and as the piston advances outward the charge of air and gas is drawn into the cylinder. At B the valve closes and from B to C, the last half of the first revolution, compression of the charge takes place, the piston receding inward. Just before completing the compression stroke the spark is made at S, and as there is an instant of time before the beginning of expansion, the point on the crank moves from S to E in this instant, through C. This travel of the crank or wrist pin represents the ignition and combustion or partial burning of the charge before effective expansion takes place. The real working stroke then begins about at E and ends at D, at which point the exhaust valve must open and remain so to the point A in order to clear the cylinder of all pressure and burnt gas in preparation for the next charge or cycle. The ignition spark should be made before inner center is reached and the exhaust valve should open before outer center is reached.

Four-cycle engines as sold to blacksmiths are either vertical or horizontal in pattern. The horizontal pattern is probably the most common. It will be noticed that very few manufacturers advertise a vertical gas engine larger in size than two or three horse-power. One of the principal reasons why the vertical engine is confined to very small patterns is that the weight of the piston and connecting rod must necessarily ride the crank shaft and its bearings. The larger the engine the heavier are these parts, and as the pressure of this weight, as well as that of the explosions, is constantly downward upon the crank shaft and its boxes, rapid wear at these points is difficult to prevent.

Heavy flywheels are noticeable on all gas engines of the single cylinder four-cycle type. These are necessary because only one impulse in every four movements of the piston can be had. The flywheels must have sufficient weight and circumference so that the momentum they gain from the impulse is sufficient to carry the piston through its other three movements necessary to complete the cycle. If there were no flywheels or swing weights of any kind the impulse would simply expend its force in carrying the piston out to its outer center where it would remain because of no inertia or force to reverse its movement and carry it back. The higher the speed of an engine the smaller the wheel and less weight it need carry in its flywheels. Where two, three or four cylinders are so arranged as to act on the same crank shaft, giving an impulse at every half-turn, very light-weight flywheels will serve the purpose.

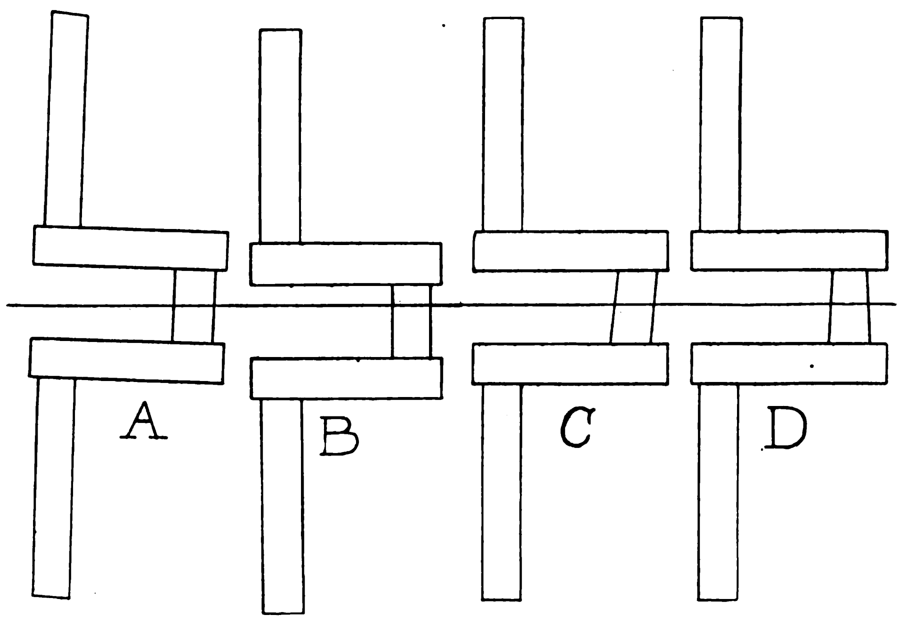


Fig. 2.—FAULTS SOMETIMES FOUND IN CRANK SHAFTS. (Exaggerated in the drawing.)

The heavy flywheels serve another purpose which is a very important one. It is that of holding a steady motion. One impulse at only every second revolution necessarily causes the engine to increase its speed at the instant of the impulse, but the speed will begin to decrease again soon after the exhaust, and very noticeably so when the engine

is driving a load. If the flywheels were not of sufficient weight, the impulse would greatly increase the speed and for want of weight to gather inertia and maintain it the speed would decrease very rapidly. This would cause great fluctuations in the speed of the engine. Consequently the weight in the wheels serves to hold the speed more constant or steady.

The crank shaft or main shaft in the gas engine is largely of the *center crank* variety, with a bearing or journal box on each side of the crank arms. It is, of course, one of the very important parts of engine mechanism. The crank shaft is made of cast steel, a drop forging or a solid steel billet, any of which, if properly done, makes a very good shaft.

The wrist or crank pin and its construction is the most important part of the shaft, because of its tendency to heating while the engine is in operation. Engineers often puzzle for days over a heated wrist pin, and many a pin and boxing is ruined before the cause of heating is located and removed. This is the point which receives the entire thrust of the explosive force. The entire power exerted or generated by the engine must be transmitted through this wrist box bearing, and the friction in the bearing should be reduced to the minimum, and the pressure equally distributed over the entire bearing surface.

One of the most common causes of persistent heating of the wrist pin or wrist box is improper alignment with the cylinder and shaft. The pin must be at right angles with the center line of the cylinder in all parts of the circle it describes, and the middle point of the crank pin or wrist pin must be exactly in line with the center line of the cylinder (see Fig. 2, A.) If the crank shaft is so placed in the journal boxes as to bring the middle point of the crank pin to one side of the center line of the cylinder it will heat (see Fig. 2, B.) If the crank pin is made out of parallel with the main shaft it will heat (see Fig. 2, C.) If the pin has a greater diameter at one end than the other it will heat, as in Fig. 2, D. A and B represent faults in lining up the crank shaft with the cylinder, and C and D represent faulty *machining up* of the crank pin. The manufacturer is generally to blame for these faults and if the wrist pin on a new engine persists in heating after thorough cleaning and oiling, some of the defects above described may be suspected.

The piston is a very important item or part in gas engine construction. Some manufacturers make extremely long pistons to obviate rapid wear in the cylinder, but the increased friction due to the greater wearing surface and weight probably overbalances any advantage gained by the extremely long piston. The manufacturer who cuts his piston extremely short in order to reduce friction and weight makes a mistake also. He will probably have a badly worn cylinder in a short time. Consequently the medium length piston is the most desirable one. To make the piston about equal in length to its stroke is not a bad rule to follow.

The piston-pin (to which the connecting rod, or pitman, is attached) should be located very near if not quite at the middle point of the piston's length. We notice that some manufacturers locate the pins just as far back in the piston as possible, while others locate it too near the open end. It is best to carry the weight of the connecting rod and pin near the center of the piston. Fig. I shows about the position it should occupy. The trunk piston similar to that shown in Fig. I is the style generally adopted by gas engine builders. Inasmuch as practically all gas engine cylinders and pistons are cast with one open end, the connecting rod connects the crank shaft with the piston without the intervening piston rod crosshead and guides as in the steam engine.

Small pistons, for engines up to and including 10 horse-power, are generally fitted with three piston rings, or, as they are sometimes called, packing rings. The object of these rings, of course, is to prevent the escape of the explosive energy past the piston.

A ring that is properly made is first cut from the ring blank or casting to nearly the size of the cylinder, leaving sufficient stock so that after the ring is cut it may be clamped into a jig with the cut ends practically together and the outside diameter of the ring is turned to a perfect circle of the same diameter as the cylinder. Rings made in this way will make what is known as a "tight piston," which will withstand the high pressures resulting from the explosions, as well as insure a good compression at all times when the valves are holding properly.

The cylinder of the gas engine is commonly cast with double walls, with an intervening water space for cooling purposes. In this space either water or oil may be used. If water is used natural circulation from the tank to the engine may be depended on, but if oil is the cooling fluid, a pump should be connected with the circulating pipes between the radiator and tank and the engine so as to insure a forced circulation. Air cooled engines are not regarded successful for constant and heavy work.

We will not have room within the scope of this article to discuss the general construction of the valves and valve governor and igniting mechanisms, all of which are very important parts in the proper construction of the gas engine. These we hope to take up in some future article. We have here confined ourselves to the discussion of the four-cycle gas engine, its principle and construction, because most engines for general use among blacksmiths are of this type. In the two-cycle engine, there are but two steps to the complete round of operation. During the outward stroke or first half-revolution of the flywheel the explosion or impulse takes place. Then on the return or back stroke of the piston, the exhaust and fuel ports both open, so that while the burnt or spent gases are going out at one end or side of the cylinder the fresh gases are coming in at the other, under pressure, to furnish charge for the next explosion. It will thus be seen that there is an impulse to each revolution of a two-cycle engine.

(To be continued.)

Batteries for Gas Engines.

BILLY BUNTZ.

Either a fluid battery or a dry battery may be used for generating the current necessary for operating the sparking mechanism on a gas engine. The latter is generally preferred, as fluid batteries easily become broken and are apt to freeze during cold weather. Fluid batteries consist of a glass jar, filled with water, to which is added about eight ounces of copper sulphate or blue vitriol, the metals used being zinc and copper. The old-time "Crowfoot" battery is the most common form of fluid battery. Some fluid batteries have a carbon cup containing a cyclindrical zinc, while in others the negative element is a double cylinder of carbon and the positive element a rod of zinc, with a couple of pints of sal-ammoniac solution as the excitant. These batteries serve very well in the country, or where they can be sheltered in winter, as they are easily renewed and save ordering batteries away from home. The carbon zinc, copper, blue vitriol or sal-ammoniac for replenishing them can usu-

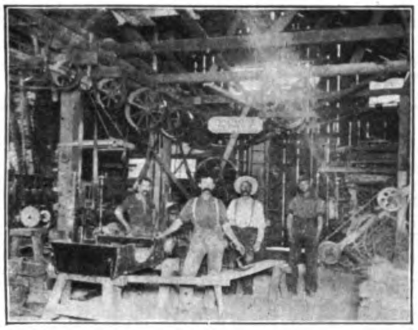
ually be furnished by a drug store or hardware house. Dealers in telegraph instruments and electrical supplies carry them in stock.

Nowadays dry batteries are much used. There are many different kinds of these. Usually they are of the sealed kind, that is, are such that cannot be renewed by the smith when they become exhausted, but as the wasted cells can be replaced by new cells at small cost, the dry battery is really a cheap one to use in supplying electric current to the igniter of a gas engine. It can't be easily broken, nor can it freeze; hence there is no trouble on that score. Usually they have a hollow cylinder and a metal plate, and contain chemicals in a dry or pasty form that become decomposed when the battery is exhausted, rather than being consumed, as in a fluid battery. Certain dry batteries can sometimes be successfully recharged by the smith where the zinc cases have not become pitted from long or heavy service—such pitting making it useless for him to endeavor to recharge them, owing to the solidifying of the battery contents.

A strong electrical current for operating the sparking apparatus of a gas engine may be had from the use of from six to ten cells of dry batteries, each cell being connected to the other and the last one connected to the electrodes on the gas engine, which communicate one with the other when a spark is needed for igniting the gas in the engine cylinder.

In shutting down a gas engine the battery switch should be turned off, else the battery will waste rapidly. When starting up, the switch can be turned on. Where dry batteries are used it is best to have a few new cells on hand, to replace those that become exhausted, thus oviating a shut-down on account of having insufficient battery current. However, where the engine is also equipped with the tube igniter, that igniter may be used pending the renewal of the batteries. As a rule, dry cells become exhausted one at a time, unless the battery switch has been left open while the engine was idle, as over night, or for a day or two, when they might all become worn out at the same time. When a battery is old it is a good plan to short circuit it for a minute or two by bringing the ends of the two wires in contact with each other.

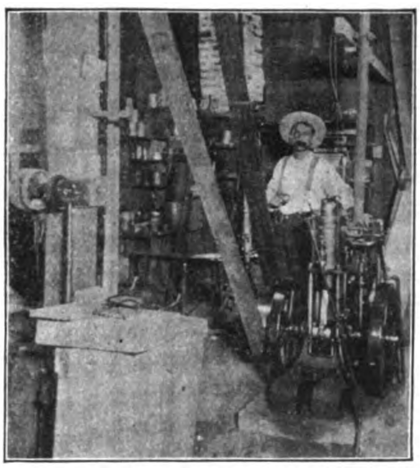
The hot tube igniter is the oldest form of igniting the gas within the cylinder of a gas engine. It is usually a small piece of gas pipe, extending from the top of the engine cylinder near the combustion chamber, the lower end of it being open so as to carry the heat or flame into the cylinder. This tube is heated by a small burner on the side of the cylinder, similar to



INTERIOR OF A CALIFORNIA SHOP.

that on a gasoline stove. Quite a number of smiths use the hot tube, as it is an efficient way of operating a gas engine, although the electric igniter is generally preferred on account of its neatness and to save renewing the tubes once or twice a week, or as they become charred. The tubes cost from five to ten cents each. A plated tube, as one coated with nickel, lasts longer than those made from plain gas pipe.

The electrodes on the engine cylinder should be kept clean in order to make the electric igniter thoroughly efficient, as they might become gummed and fail to work, and this would lead a novice to



ENGINE CORNER IN CALIFORNIA SHOP.

think that his batteries had become exhausted or weak, while in reality they would be perfectly strong.

There are several kinds of magnetos or small dynamos for generating current for operating the electrodes of a gas engine. A number of these are advertised in THE AMERICAN BLACKSMITH. They are very efficient, and any smith can save on batteries by using a generator of this kind.

Whether a dry battery or a fluid one is used, buy the best. It costs a little more at the outset but less in the end. If it is desired to do away with batteries altogether or to the greatest extent, then the auto-sparker, miniature dynamo, etc., are highly recommended.

A Gas Engine in a California Shop.

J. H. PINCKNEY.

The illustrations shown herewith are of my 2½-horsepower Samson Gasoline Engine, made by the Samson Iron Works, Stockton, Cal., and the interior of my shop. The engine runs the following machines: a band saw, a buzz planer, a boring machine, a sand belt, an emery grinder, a drilling machine, a blower for two fires, two grindstones, and also pumps gasoline from the large tank to the engine, and I have power to spare.

Power in the Blacksmith Shop—Does it Pay?

Prize Contest Article.

T. P. MCCANNE.

Speaking from experience, I say yes. I have worked at the trade for fifteen years, eleven and a half years with hand tools and without any form of power and three and a half years with a Fairbanks-Morse, (Chicago, Ill.,) one and a half horsepower gasoline engine. First I will speak of the limit to the capacity of the shop without power. The work that comes to the average shop depends largely upon the energy and capacity of the mechanic.

For instance, if a plow share is to be made, our man without power must first get his steel hot, which necessarily takes him from thirty to forty minutes, working like a trooper, either pumping a bellows or turning a blower crank. He then takes it from the fire and with the helper and cleaver cuts part of the way. It generally takes three heats to cut out and three to draw to shape. I know from experience that it takes the smith and his helper about three and one half hours to make the share, at a cost of twenty cents an hour for the helper, which makes seventy cents, thirty cents an hour for the smith, or $1.05, several pounds of steel at 3½ cents, and twenty-five cents for coal. You will see from the above figures that the plow share would cost more than $2.10, to say nothing of the wear of tools. The price for such a share (14-inch) in this country is two dollars and fifty cents, so that you see the smith gets only 40 cents profit on his job. This is about the way with all hand jobs, due principally to the length of time consumed in doing the work. Then again if a man goes to a

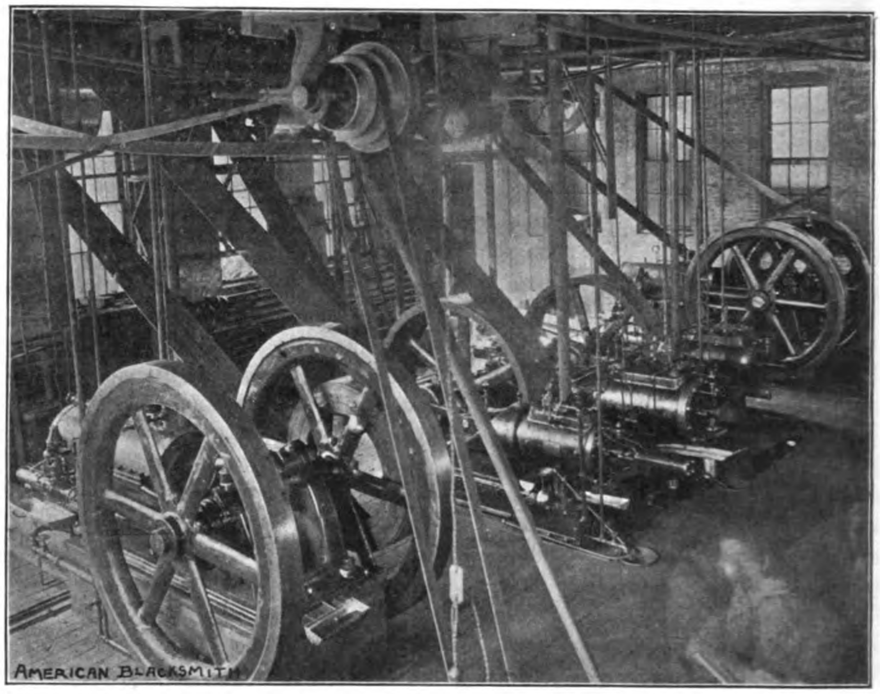
shop to have a piece of work done, and the smith is a little behind-hand and he has to wait almost a half a day, he is apt to grumble at the price charged, because the price charged for the job is small compared with what time the customer has lost, which perhaps is more valuable than that of the mechanic. You will see that be a man ever so energetic he can only accomplish a certain class of work by hand, whereas if he has a cheap power, he can push his business right along.

Now let us take this same plow share made with power. The man goes to his engine, turns the electric button, sets his machine in motion, strikes a fire in the forge, which may be a down draft one, made by the Buffalo Forge Co., Buffalo, N. Y., and hence no smoke or dust. He turns on his fan belt and while his fire is kindling, he gets his slab of steel, which has been previously marked, steps to his rotary shear and cuts out the share, then puts it into his fire while his heat comes. He may talk to his customer about his crops or other things of interest, which goes a long ways towards smoothing the road for a nice round price for the work. When the heat is up, he turns to his trip hammer and draws to shape, say in two heats at the outside. Then back to the fire and brings up to a weld, after which he places it in the welding press, also run by power, then to the emery stone to polish, all of which can be done inside of an hour and a half. Let us figure the cost of these machines: Engine, $250; hammer, $100; shear, $100; emery wheel, $50; drill, $50; total, $500. A helper at two dollars a day would cost $600. So that you see if these machines had to be bought each year there would still be one hundred dollars to buy belt shafts, pulleys and the like, but if we run on next year we have our own machines all in good order to go ahead, whereas if we had a helper it is all to do over again. So you see if the mechanic could only do the same work with the aid of machinery, he would be in position to pocket the helper's wages the second year. But this is not the case, lest some one might say that I wish to knock out the wage-earner. I want to state here that the capacity of our man with power is so great that where he worked one man by hand, he will work two by the use of machinery.

Let us notice some of the things he cannot approach by hand. First he may own a lathe and do all manner of turned work in wood, gaining a good customer from his carpenter friend; also his lumberman. He may run a rip saw and band saw, and cut all manner of strips, circles and segments for his customers because he can always have a nice line of reaches, sills, crossbars, and sidebars, and the like cut from cull axles and tongues bought from a jobber at a nominal cost.

Now as I have said, I ran a shop for eleven and a half years by hand and owned my shop all the time. Nine hundred dollars' worth of work was the largest year's work I ever did by hand. Three and a half years ago I bought a gasoline engine, emery stand, and power drill press, and built a wood lathe, together with a saw stand with rip and cut off. The first year I cleared enough to pay for all the above machines. Last year I did nearly two thousand dollars worth of work, buying also a blower, which runs two fires.

Just here I want to say that in the shop plans of brother smiths, I notice so many have power, but no power blower. I cannot conceive of a greater mistake. I only consume one and a half gallons of gasoline per day, running the above machines at a cost of seventeen cents per gallon. Therefore, in my belief the man with power has at least 50 per cent. the advantage in time and 75 per cent. in capacity and an unlimited field for his energy. Besides, your customers are better satisfied to think they are dealing with an up-to-date man. It is a fact that wherever a man pushes ahead, the plodder always abandons the field. The gas engine is without doubt a time-saver and a money-maker and the smith who declines to get one is making a mistake.



GAS ENGINES OF THE STAR DRILLING MACHINE COMPANY.

The Cost of Small Power.

Gas Power cites the case of a little machine shop near New York that installed several years ago a small slide-valve steam engine and an upright boiler, the latter capable of giving about 15 horse-power. The engine, however, seldom called for more than three horse-power at most, and for a large part of the time probably not much over half of this.

As steam had to be kept up all day, practically ten hours, it was found that the cost of coal, which was nearly six dollars a ton, came to 90 cents a day.

Gasoline in this same locality is selling at 18 cents a gallon. In spite of that the owner of the shop installed a small upright two-cycle engine, more with the idea of saving a fireman's wages, $2.00 a day, than with the intention of reducing his fuel bill. After a month's running it was found that his gasoline had cost $13.00, against a previous cost for coal of $23.40. So that his total saving was $62.40 a month on an investment of about $175.

Granting that this is an extreme case, there is still little question but what the gasoline engine in small powers is much cheaper than steam.

An Up-to-date Gas Engine Plant.

The plant of the Star Drilling Machine Company, at Akron, Ohio, is of

interest, as it is one of the few large plants operated entirely by gas engines.

The power plant consists of four 60 and one 35-horsepower Columbus Engines, making a total of 275 horsepower. These engines are so distributed throughout the various departments as to reduce the amount of shafting to a minimum, and were installed by the Columbus Machine Company, of Columbus, Ohio.

One 60-horsepower engine operates the wood-working machinery, another 60 operates the metal working department and the 35 operates the lighting plant. The other two 60-horsepower engines shown in the engraving drive air compressors to operate drop hammers, formerly operated by steam, and all other small pneumatic tools, such as drills, chipping hammers and hoists.

The Star Drilling Machine Co. state that they find this division of their power very convenient, as they can run any part of the plant without operating the balance, and having no long lines of shafting, the loss by friction is small, and the cost of attendance, fuel and supplies much less than with the abandoned steam plant.

The Gasoline Engine for Smiths.

Prize Article.

WOOD BROTHERS.

We have a gasoline engine in our shop, a Fairbanks-Morse six horsepower engine, which will run at full power for ten hours on six gallons of gasoline. The engine cost three hundred dollars complete set up in the shop, and we consider it the best investment we ever made. We have a rip-saw, a band-saw, a planer, a frizzer, a turning lathe, an emery grinder, a boring machine and could run a drill with the same power. We saw our own felloes and hounds on the bandsaw, and then dress them on the planer, which makes each piece the same size and true. This enables the smith to have a full assortment of felloes and hounds at about one-fourth the amount it would cost him to buy them from the dealer, and he is always ready to do a job when it comes to the shop. Then we find that power aids us very much in getting the work ready for the customer, which is the greatest help to the smith. We dress all the timber used in repairing and making new work and it can be dressed in about one-tenth the time it would take to do it by hand and is much nicer to work. We use the frizzer for shaping hounds and plow beams, and chamfering is much better done this way than by hand. The boring machine, another great time-saver, will bore 300 ¾-inch holes in 3 by 3-inch harrow-frame timbers in an hour. We have a metal turning lathe which will turn a 7½-foot shaft or an 18-inch pulley. One man with the use of the engine can do from ten to fifteen dollars' worth of work per day. Men come from all around us to get felloes and hounds sawed. We also grind chill plow points, discs, cutting box blades and mowing machine knives.

The gasoline engine is always ready to start. We use an electric igniter and can start the engine in three minutes and when the work is finished there is no more expense until another job comes along. We put in our engine in June, 1903, and our business last year increased $1,740, with the same number of hands.

Then it makes the work much lighter on the smith. We expect to get a trip hammer and a power drill which will be run by the same engine. We find that a lighter engine would do all the work except running the rip saw, which takes most of the power we have. Sometimes we can saw 5-inch hickory with a 16-inch saw. A four-horsepower engine would run all the other machines we have. Our engine has never given us any trouble and we consider it safer than steam. The gasoline tank being buried in the ground out in the timber shed at the side of the shop makes an explosion impossible. We would advise any smith to get a good make of engine even at a little more cost, for it will pay in the end. There are five other engines in our town, one of them a Fairbanks-Morse and one a Charter, both giving perfect satisfaction. The others run when everything is all right, but if not, they give a great deal of trouble. We think that if a smith is in a fair stand, a gasoline engine to suit his trade will pay for itself in a year, and gasoline is the best and cheapest power that the smith can have.

The Advantages of Gas Engines for Smith Shops.

A Brief Summary.

A gas engine lightens the labor.

It increases the shop capacity; enables more and better work to be done, quicker and cheaper.

It stamps the owner as progressive and advertises the shop.

It attracts trade.

It permits the smith to do work otherwise impossible.

It permits side lines to be taken up.

They are a cheap source of power.

They may be stopped or started at a moment's notice.

All expense stops with the engine.

They are easy to operate.

They require no licensed engineer to run them.

There is no boiler to keep right, no steam to keep up, no ashes to keep down.

They can be set up anywhere and run by anyone.

The fuel is cheap and obtainable anywhere.

The repair expense is trifling.

They take the place of a helper and never go on strike.

They are simple and safe.

They are a good investment from most every standpoint.

Delicate Colors and Their Application.

Preparing Grounds for Vermilion, Some of the Yellows, the Blues, Wine Colors, Carmine, Etc. Applying These Colors and the Method of Procuring Best Results.

M. C. HILLICK.

One of the chief troubles which the country and village carriage painter meets with is in getting the best possible effects from the colors used. The painter working in surroundings entirely different than those met with in the large town or city shop finds himself at a decided disadvantage when sensitive and delicate colors must be handled in order to meet the demand of a public that is growing more and more exacting in respect to color effects and to the character of the finish bestowed upon them.

Vermilion, for example, while not a new color, has within the year returned for a new reign of popularity, and with its return has come the problem of getting the color upon the surface in a way to show all the glow which the color is capable of, when properly treated. While vermilion is a pigment with a good covering power, it is nevertheless the heaviest pigment known in proportion to bulk, and because of this fact, the painter finds difficulty in keeping the pigment sufficiently well mixed to insure requisite opacity or covering power.

Vermilion requires a strong, clean, perfectly prepared ground to develop its best color resources. There should be smoothness to the ground—a smoothness that furnishes absolute freedom from particles and specks of dirt—along with a substantial solidity of color. Bring the surface up in the usual way and when it has been worked thoroughly level and smooth, apply a coat of peach-blow color, which may be made of white lead and Indian red, with perhaps a very small per cent. of the vermilion added. Mix this with a binder of oil, if upon the running parts, thinning to the

right consistency with turpentine, and in case of body surfaces we use rough-stuff; use elastic rubbing varnish instead of oil, for the binder. Apply this coat with a camel's hair brush and seek to lay it as smooth and clean as if it were the actual vermilion coat.

Mix the vermilion for the first coat to apply over the peach-blow color with sufficient elastic rubbing varnish to give it a decided gloss. A fine, soft bristle brush is the best tool with which to apply the vermilion. Permit this coat to dry through and then apply a second coat of vermilion, which should be mixed as a color-and-varnish, only enough color being used to stain the varnish and enrich the color beneath. This is the sure method of getting the natural brilliancy of the vermilion into the foreground—indeed it is the method necessary to develop the brilliancy of any member of the red family of pigments.

The delicate yellows, constantly and justly popular, such as cream color, canary yellow, 20th Century yellow, primrose, straw color, etc., require exceedingly fine and carefully adjusted grounds. For all these make the ground pure white, and bringing it up through the required coatings, carefully sandpaper and putty so that none of these processes will be necessary upon the last coat of white. Then apply the yellow directly upon the white, and for the final coat of yellow use enough varnish to convert the mass into a free working color-and-varnish, which may be either applied with a camel's hair or a soft, full elastic bristle brush. By this process, any one of the yellows above named will show an undreamed-of lustre and richness; and in addition the color will have a permanence, and will hold to its original purity of tone far more durably than if it were otherwise employed.

What has been said of the yellows in respect to careful preparation of the ground colors will apply with equal force to the ground colors for the aristocratic family of blue pigments. The ultramarine blue, despite the fact that within recent years some very smart shades of blue have been brought into use as competitors of the ultramarine, continues to hold the foremost position as a popular carriage color. The ultramarine is incapable of being used otherwise than as a glazing color, it being more than semi-transparent; and it requires a ground in all respects thoroughly built up and perfected. Any imperfection found to exist in the blue can only be remedied by going back to the early stage of the foundation—at any rate, back of the final coat of ground color. There can be no touching up of the surface after the application of the ultramarine—at least no touching up that will pass unobserved.

A satisfactory ground for ultramarine blue is a dark brown made of five parts of Indian red, and one part drop black and one part Russian blue. Some carriage painters use a ground composed of lampblack. Mix the ultramarine in elastic rubbing varnish, using merely enough of the color to stain the varnish. Flow the varnish-color or glaze on the surface freely—just as you would the clear varnish, in fact. Possibly you may be discouraged at the outcome, for the surface, instead of being the rich, solid blue characteristic of this color, as seen in city repositories, may show a lack of solidity somewhat astonishing to the inexperienced. But when the coat has hardened sufficiently—which means, of course, a condition that will permit rubbing with No. 00 pulverized pumice stone and water—proceed to rub the surface enough to deaden the gloss and smooth away all the dust and dirt specks, if any, and then after carefully washing the surface with clean water, flow on a second coat of the glaze color. Under this second flow of varnish and color the surface should show a clean, solid, uniform field of blue unmatched for beauty and brilliancy of color.

For an especially rich and singularly beautiful blue, flow medium ultramarine blue over a ground of very deep green—20th century green, for example.

The wine colors are for the most part very effective and fetching colors upon such vehicles as surreys, medium weight buggies, depot wagons and paneled top delivery wagons. There are three shades of what is commonly known as wine colors, and when furnished with strong durable grounds these wine pigments wear well, retaining their brilliancy for a long season of service. Indian red slightly darkened with an addition of black—say four parts Indian red and one part drop black—gives a good ground color. To counteract the fading and flaking tendency of the wine color, two faults commonly charged against the pigment, use enough varnish in the ground color to give it a positive gloss when dry. Use the wine color in varnish quite the same as advised for the ultramarine blue, although the wine color, being a pigment of stronger covering power, will furnish adequate opacity of surface with a simple coat.

Maroon lake, a reigning favorite in all sections of the country chiefly as a color, is seen at its best when glazed over a deep Tuscan red ground. The word of caution that has run all through the directions for preparing the ground for the various colors above mentioned urgently needs repeating here. The utmost care and skill are needed to the end that the surface be provided with all the required elements of perfection—smoothness, cleanliness, solidity of color, with a close approach in shade to the maroon lake itself.

Carmine, ever beautiful, and splendid

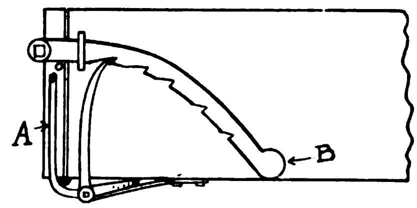


Fig. 1.—SIDE VIEW OF END GATE FASTENER.

in its glow of color even when unadorned, is not the difficult color to handle and apply that the inexperienced are sometimes led to believe. A fine and flawless ground it must have, but this having been acquired, the rest is comparatively easy. For a light carmine, something with all the fire of vermilion with the added richness of the color of ancient glory, bring the surface carefully up to the regulation vermilion coat, making the vermilion, however, to dry without any perceptible gloss. Then apply a coat of clear rubbing varnish into which a few drops of No. 40 carmine have been injected. This varnish, once dry, may

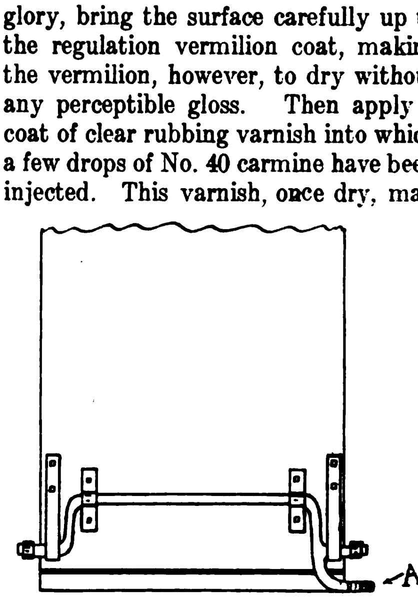
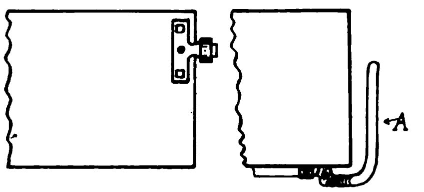


Fig. 2.—BOTTOM PLAN OF END GATE FASTENER.

then be rubbed with pumice stone flour and water sufficiently to knock off the gloss completely. The rubbing varnish serves to even up and eliminate the inequalities of the surface, and to remove a certain "fuzzy" feeling which nearly all red pigments when applied as flat colors possess. And in case of extremely light carmine—light reds of all kinds, in fact—any surface defects, however minute, become strikingly prominent. The surface having been rubbed and washed up, next apply the carmine, adding the

pigment ground in Japan, and best purchased in four-ounce collapsible tubes, to the varnish on the basis of $\frac{3}{4}$-ounces of carmine to one pint of elastic rubbing varnish. Apply with a soft badger hair brush, and flow the glaze on quite as freely as you would apply the clear rubbing varnish. For a dark, rich carmine, make the ground of Indian red, and apply the carmine directly to the flat coat of pigment, omitting the varnish coat as used in case of the light carmine. For a medium light carmine make the ground of Indian red to which has been added say 20 per cent. of English vermilion both to lighten and enrich the ground.



Figs. 3 and 4.—SHOWING DETAILS OF FASTENER.

To this color, when applied and dry, apply the carmine glaze, mixed as above directed. In applying the carmine do not make the mistake of coating the surface "piecemeal." Flow an entire wheel at once, or at least half of an ordinary carriage gear, or a large panel, etc., working the glaze clear and free. This will insure a surface of uniform color and brilliancy, a result necessary to best develop the real quality of all red pigments—indeed, of all pigments.

End Gate Fastener for Spring Wagons.

J. LAWRENCE HILL.

There is always more or less trouble experienced with all end gate fasteners. Those with a spring which require the thumb to release are sometimes too stiff or too soft so that they will not catch or even return to their proper position; the hole style will get out of alignment, by the spreading of the sides; there is also the drawback that it requires both hands at the same time to open the usual run of fasteners.

With this style, the objectionable features mentioned above are eliminated, first because the handle has a leverage, which enables it to overcome the stiffness of a spring; second, that one handle operates both catches, leaving the other one free to steady or pull open the door, and it has the additional advantage of allowing the gate to be partially opened and holding it so.

Fig. 1 shows the side with the handle, the other side is the same, minus the handle A; the shape of this is seen in Figs. 1, 2, and 4. The spring seen underneath the body in Figs. 1 and 2 must be good and stiff, as it is this which keeps the catch in position. The teeth in B need not be at regular intervals, only where they are required. There is a little pin or stud driven into the gate end, Fig 1, which keeps B from falling too low when the catch is out. Without this pin the teeth would catch in the staple, which is necessary in order to prevent B from leaving the sides of the body.

A Useful Wood-Working Shaper.

J. H. JENSON.

The following drawings and description of a home-made shaper will probably interest those who have wood-working to do in their shops. The top or table is made from two pieces of hard wood, 2″x9″x3 feet 9 inches, held together with three bolts $\frac{1}{2}$x19$\frac{1}{2}$ inches, so that it can always be tightly clamped. Each leg at the front will take 23 inches of stock, while the arms above will take 12 inches. The rear legs are of angle iron, 2″ by 2″ by 2′10″, leaving two inches at each end, to bend for feet at bottom and for fastening to table at top. The shaft at rear is $1\frac{1}{8}$ inches in diameter and 2 feet long, with a collar at each end. The tight and loose pulleys are $2\frac{1}{2}$ inches face and 6 inches in diameter, the drive pulley 2 by 12 inches.

The two pairs of arms meeting above and below spread out to the legs behind, and extend out in front so as to hold the boxings of the shaper shaft. These arms are not shown in the side view.

The pieces which hold the shaper shaft are 2 feet 10 inches long; the piece to which front legs and arms fasten is $\frac{1}{2}$ by $3\frac{1}{2}$ by 18 inches long.

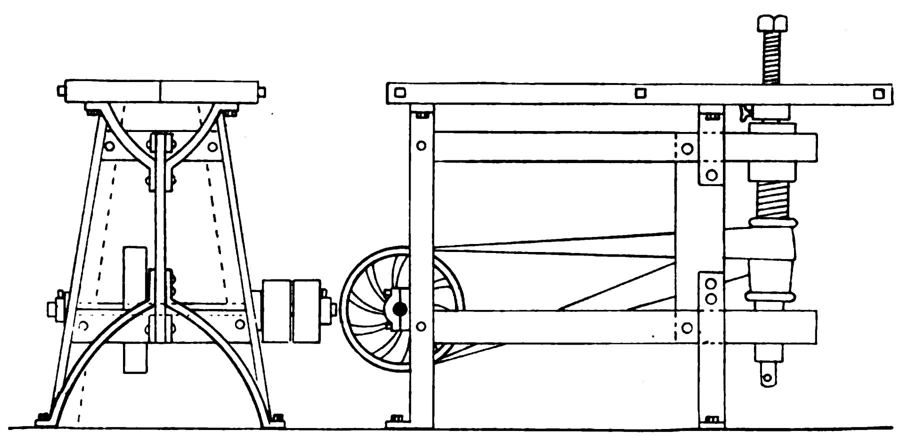
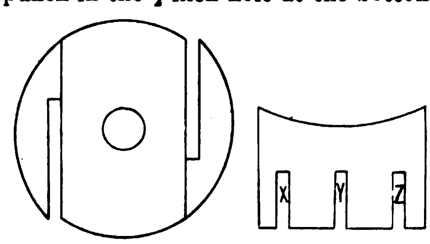


Fig. 1.—A HOME-MADE WOOD-WORKING SHAPER.

The shaft itself is $1\frac{1}{8}$ inches in diameter and 2 feet 8 inches long, with a $\frac{1}{2}$-inch hole bored in the bottom end for use when screwing nuts down on shaper head, or when raising and lowering shaper head, as will be explained later. This latter is necessary in order to accommodate different classes of work. The shaft for 5 inches at the top is threaded, being $\frac{3}{4}$ inch in diameter, and has a collar (not shown) driven down tight. Also it has two lock nuts at the top. A one-inch collar is set on the end of a piece of pipe, with a set screw in it for tightening on the shaft when it is desired to raise or lower same. This pipe is 9 inches long and makes the top boxing or bearing. It is threaded the entire length up to the collar, and on the pipe is a coupling, which has been split with a hack saw so that it can be tightened up, or loosened when raising or lowering the shaft. There is a 7-inch pulley with flanges on the shaft. The lower boxing, 6 inches long, is made from another piece of pipe and babbitted.

To raise or lower the head, first loosen set screw on coupling which holds the bearing, and then tighten set screw in collar at top of bearing. Insert a punch in the $\frac{1}{2}$-inch hole at the bottom



A B

Fig. 2.—SHAPER HEAD AND CUTTER.

of shaft and screw it up or down as desired.

This machine can also be used as a circular saw for small work. Of course it has its limits. With it you can do felloes, rims and such work.

Referring to Fig. 2, A, is an end view of shaper head. This style of head needs no guide for felloe work. At B, which indicates the cutter, notches X and Z are for set screws to hold cutter, and notch Y is for the part of head which serves as guide.

The average mechanic will find this shaper easy to make, and very useful when finished.

The Smithing of Sigfrid's Sword.

JOHN LUDWIG UHLAND.

Sigfrid was young, and haughty, and proud,
When his father's home he disavowed.

In his father's house he would not abide;
He would wander over the world so wide.

He met many a knight in wood and field,
With shining sword and glittering shield.

But Sigfrid had only a staff of oak;
He held him shamed in sight of the folk.

And as he went through a darksome wood,
He came where a lowly smithy stood.

There was iron and steel in right good store;
And a fire that did flicker, and flame, and roar.

"O smithing-carle, good master of mine,
Teach me this forging craft of thine.

Teach me the lore of shield and blade,
And how the right good swords are made."

He struck with the hammer a mighty blow,
And the anvil deep in the ground did go.

He struck: through the wood the echoes rang,
And all the iron in flinders sprang.

And out of the last left iron bar
He fashioned a sword that shone as a star.

"Now have I smithied a right good sword,
And no man shall be my master and lord.

And giants and dragons of wood and field
I shall meet like a hero, under shield."

HEATS SPARKS WELDS

Harvest Time—welcome days.

Be prepared for your fall and early winter trade.

Uncle Sam has over fifteen thousand rural free delivery mail routes.

Success is failure kicked to pieces by hard words. Are you kicking?

Don't wait for the other fellow to answer that question. If you know the answer send it in for publication.

Hair springs—made out of iron at three dollars a ton; one pound of them is worth seventeen and a half pounds of gold.

Some men complain about not getting their share of trade. They are usually the ones, however, who don't advertise or go after it.

Do you agree with everything said in this journal? No? Then send in your opinion and let the boys hear your side of the story.

Glass was first used for windows about the year 300 A. D. Its existence can be traced back more than two thousand years before Christ.

Leather cannon killed and injured more men at the battle of Leipsic than the magazine rifles and machine guns did during the Boer war.

Don't fail to ask questions on any point that troubles you. The mission of THE AMERICAN BLACKSMITH is to help as well as interest its readers. Ask us.

In Lapland is a lake having fresh water on top and salt water below. Its level rises and falls with the tide—probably it is connected with the sea by an underground channel.

The business man in these days of keen competition closely scrutinizes from a credit viewpoint all orders that come too easily, before he accepts them. Herein is a hint to smiths.

Screws used in watches—some of them are so small that it takes over 300,000 of them to weigh a pound; quite different from the one weighing over 17 tons told of last month on this page.

Like a two-edged sword, competition works both ways—it is either the life or death of trade. What are the smiths doing in your neighborhood? Are they killing prices? It's time to organize.

Some smiths set aside a certain sum each year towards buying new tools, or replacing worn-out ones, and improving their equipment so as to turn out more or better work. A mighty good plan.

Four months more and the icy times will be back again. Realize that? Just about enough time to get your neighborhood solidly organized for higher prices and better times before sharpening sets in.

Petty things.—Don't overlook the small things—constant dripping will wear away a stone. Teach the helper to be more saving; a careless man will waste coal, iron, bolts, nuts, and most any of the things he handles.

A full appreciation of the value of each present moment is one of the hardest things for many to acquire, and one of the most valuable possessions when once obtained. In it lies much of the secret of success or failure. Do it now!

What special efforts are you making at this time to collect old accounts? The best time to press a collection is when the customer is "flush." Perhaps your method of handling old debts would make interesting telling in these columns.

A smith we know invested in a horse rack and now shoes horses whose owners would never have heard of him had he not put in a rack. He has customers come from miles around. This is advertising. An up-to-date shop speaks for itself.

Ahead of time.—The value of being before-handed is most prettily illustrated by keeping the fire insurance policy always paid up. 'Tis said a fire always waits for the policy to run out. When does yours expire? Of course, your shop is insured.

Three gunboats built on the Thames, England, were recently taken apart and shipped by steamer and train to Kosheh on the Nile, a distance of over 4,000 miles. When they were put together at the end of their journey, not a single piece was missing.

Do you know pretty closely your cost and your profit on each job? If you don't, some figuring is in order. Figure in your time and your helper's, rent or taxes, coal, fuel, light, repairs, new tool fund—every item of shop expense should enter into your cost estimates.

If you wait until harvesting time for those machines to be brought in for repairs, you may be swamped with work. Same way with the broken sleighs. Best way is to talk to the owners. Wake 'em up. Don't let them wait till the very last minute to bring in the job.

Does your subscription expire with this number? Send in your renewal today, immediately; for next month starts a new volume and you don't want to miss one number, for we are going to make the paper better and more valuable than ever before. Our specially low long-time rates on page 221 of this issue, will enable you to save.

What's your side line? Some of our smith friends are doing the following for extra profit: Wood sawing, feed grinding, horse clipping, disc sharpening, rubber tiring, cider making, wagon painting, knife making, ornamental iron work, and running agencies for farm wagons, agricultural implements or gas engines. One of the boys is using his engine to furnish electric light for the town.

Tom's wife, faithful soul, had a few hundred dollars left her last month. The hard-worked woman wanted Tom to take it and fix up his place, put in new tools and be prepared to meet the competition of other shops. "No, wouldn't pay. No money in blacksmithing nowadays," was Tom's answer. They say Tom plays the races occasionally, and is given to a few like stunts. Apparently Tom thinks this a good way to use his cash. At any rate, the funds will be much safer in the bank in her name.

Scientific Blacksmithing.—Germany has seven schools solely devoted to the training of blacksmiths and locksmiths. Only public school graduates are admitted at these schools, and the course lasts about three years. The course at the Rosswein school is highly advanced, comprising physics, chemistry, electricity and the practical construction of machinery, and only students who have completed a course at one of the other schools are admitted. The schools are supported by the smiths, the government and private contributors.

Don'ts for the gas engineer. A good deal has been said about the gas engine in this number and Heats, Sparks, Welds thinks a few don'ts will not come amiss here:—

Don't oil the sparker shaft.

Don't forget to feed the engine.

Don't feed it too much fuel.

Don't expect the engine to run all day without any care.

Don't install an engine in a dark or damp place or on weak flooring.

Don't fail to switch off battery current at night or you will exhaust it.

Don't get excited when starting the engine and don't be afraid of it.

Don't allow anyone to stand too close to the engine when it is running.

Don't forget to switch on battery current before trying to start the engine.

Don't keep the gasoline in a tightly closed tank—it may cause trouble.

Don't think a gas engine doesn't need cleaning—have a regular time for it.

Don't allow any nuts or bolts to become loose—examine the engine frequently.

Don't fail to drain cylinder jacket in cold weather for the water may freeze.

Don't use steam engine oil to lubricate a gas engine, as the conditions are different.

American Association of Blacksmiths and Horseshoers.

A comparatively short time remains now before fall and winter trade sets in. Many blacksmiths are planning to use that time in an effort to raise the prices in their neighborhood and there are few smiths who cannot do likewise with profit. A strong, enthusiastic effort now will be repaid many times over when the run of work at sharpening time comes on. Of course, if any shop feels it is getting as much for its work as it should, then a movement for better prices will not interest it. But how many shops are making the money they should?

Undoubtedly something is wrong with any industrious blacksmith who is content with prices that bring him only a bare living from his labor. There are other things to be thought of besides daily bread—old age or a rainy day ahead, for instance, to say nothing of the comforts and conveniences that his family ought to have.

The solution of the problem is better prices, and the road to better prices is organization. The time is *now*. Any blacksmith can start a movement to bring his neighbor craftsmen together in an organization for their mutual benefit. Write to us for our plans. We will lend a helping hand. But *don't* sit and wait for the other fellow to start things. He never does.

Calculating Stock and Weights of Forgings.

BY A. W. B.

Among the problems which sometimes arise to worry blacksmiths is the one which causes the question—"How much stock will it take to make this forging?" Oftentimes the smith will cut and try till he gets it right, and while this method may answer at times, it cannot be recommended, especially when the ability to make a few simple calculations will enable him to determine beforehand just how much stock is needed, saving both time and material. Then again situations may arise where it is impossible to get along without making some such calculations. Such a case will be considered here and an explanation given.

Referring to the figure, we will suppose the smith is given a bar of stock 4 inches in diameter and told to cut off a piece, A, long enough to make the forging B, the working drawings for which appear at C. The question is, then, how much to cut? The principle upon which we proceed is that the volume of the finished forging will be practically equal to the volume of the piece with which we start. Hence from the dimensions given we calculate the volume of the finished piece in cubic inches. Then we find out how long a piece of the original stock will contain that number of cubic inches. The process is simple, and is worked out as follows:

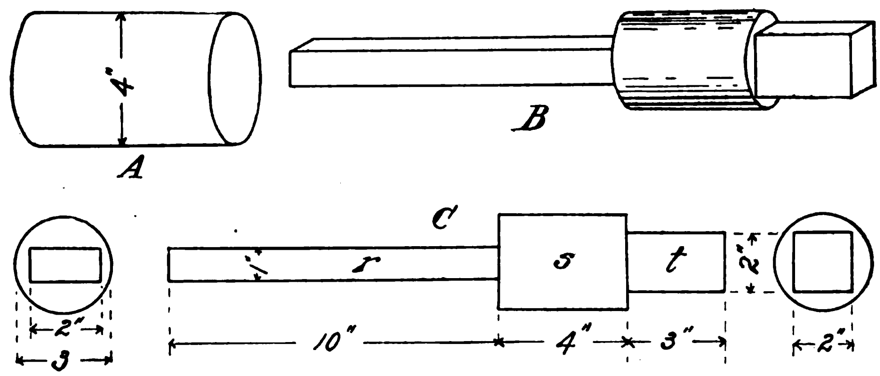
Referring to Fig. 1, C, our finished piece has a volume equal to the sum of the volumes of the parts r, s and t. The volume of any rectangular piece in cubic inches is equal to its length times its breadth, times its thickness, all in inches. The volume of a cylindrical piece is equal to the area of its circular base times its length, the base area being found by multiplying its radius (half the diameter) by its radius and then by $3\frac{1}{7}$. Hence we have as the volumes of r, s, t and the entire piece:

r- -2 x1x10= 20 cubic inches
s- $-1\frac{1}{2}$x$1\frac{1}{2}$x$3\frac{1}{7}$x4= $28\frac{2}{7}$ " "
t- -2 x2 x3= 12 " "
Total volume.....$60\frac{2}{7}$ cubic inches

Hence we shall need to cut off about 60 cubic inches from our original bar. The number of cubic inches contained in a disc or slice of this bar one inch long is 2x2x$3\frac{1}{7}$x1=$12\frac{4}{7}$ or roughly, $12\frac{1}{2}$ cubic inches. Then dividing 60 by $12\frac{1}{2}$ we get 4.8 inches as the length of the original bar that would contain 60 cubic inches. Hence if the smith cuts off 5 inches, he will have just enough to complete his forging, allowing a little for fillets and scaling.

In calculating stock required to bend a circular ring, the following formula may be used: $L=3\frac{1}{7}\times(D+t)$. That is, add the inside diameter, D, of the ring to the thickness, t, of the stock and multiply this by $3\frac{1}{7}$. A link may be considered as two semi circles joined by two straight pieces, and its length found in this way. This does not make any allowance for scarfing.

It is frequently desired to know the weight of a certain forging. This may be found by first finding the volume. Iron weighs 480 pounds per cubic foot or 0.278 pounds to every cubic inch. Steel weighs 490 pounds per cubic foot and 0.283 pounds per cubic inch. A simple rule for finding the weight of rods and bars is as follows. Multiply the breadth by the thickness and this by 64. Then for flat or square bars divide by 19; for rods or round pieces divide by 24. The result will be the weight in pounds of a one-foot length of the given stock. If considerable accuracy is desired use 19.2 for flats and 24.4 for rounds as the divisor. These are for iron. Steel, on an average, is 2 per cent. heavier. Referring to the figure, the weight of the cylindrical part (s) is as follows: 3x3x64 =576. Dividing by 24, (576÷24=24) we have 24 pounds per foot of length as the weight of the 3-inch rod, so that the part (s), being $\frac{1}{3}$ foot long, would weigh 8 pounds. This is a trifle high. Similarly for part r, 2x1x64=128, and dividing by 19, we get 6.74 pounds as the weight of a foot length. Ten inches would weigh (6.74x$\frac{10}{12}$=) about $5\frac{1}{2}$ pounds.



HOW TO CALCULATE STOCK AND WEIGHTS OF FORGINGS.

The Progressive Smith as a Business Man.—11.

How to Buy a Smithshop.

BILLY BUNTZ.

"Simply pay your money and take a deed," say folks who don't think business methods worthy of consideration. However, there is a deal of risk in buying haphazard or by taking for granted everything that is said concerning a property. It is but natural for an owner to think his property an excellent one and speak of its worth and advantages, meanwhile covering any drawbacks it may have. These the buyer must ascertain or see.

THE AMERICAN BLACKSMITH from time to time contains the advertisements of some good property bargains in its "For Sale" columns.

The shrewd smith knows that of first importance to buying *anything* is that of having previously considered whether, if the thing was bought, it would serve

a profitable end. Thus, in considering whether he should buy a shop, he takes into consideration the rate of rent he is paying or how much his rent would amount to in five or ten years and whether it would be good policy at the end of that time to hold only a bundle of rent receipts or a good equity in a shop, although there are cases, of course, where it might be as cheap to rent as to own, though there is seldom the same satisfaction; he considers whether he requires additional room, whether he could obtain a more suitable or prominent location or a better shop or one having more custom, etc., etc. It is by *thinking* about his business, conditions surrounding it, and the improvements desired that enable him to formulate thoughts which give him an opinion and bring him judgment when he has an opportunity to buy. Often a building or shop is put on sale so suddenly that folks who have given the subject of buying but little thought, are unable to judge or determine the policy or advisability of doing so until after some one with broad perception has "gobbled" the bargain, when the others exclaim "I ought to kick myself!" Think of your necessities, your requirements, look for bargains. A good chance to buy may present itself as early as the morrow.

As a rule, it is wise to buy a shop as soon as the trade of smithing is mastered, or as soon thereafter as finances permit, even though the shop be bought on payments or half on time. Of course all rules have exceptions and circumstances might reverse conditions. The advisability of each individual smith owning his shop is for himself to determine.

Although a shop may be bought quickly in order to forestall others rom obtaining a bargain or desirable property, yet where caution is used and judgment exercised, there are considerable preliminaries attendant upon the transaction. The owner or his agent must be talked with, the reason for selling ascertained, as well as the amount of custom the shop has, the price, etc., while by cross-questioning or doubting the opinions of the owner, he might willingly produce books, receipts or his deed to substantiate his ideas about the present worth of the shop; at any rate, there is little to be gained by agreeing with the owner in all he says, as he is likely to want a rather high price, especially if not over-anxious about selling. However, where the smith is particularly anxious to buy, he still has the chance of afterward concluding to make a better offer.

Before considering the price seriously or making a binding offer, the building should be examined carefully and its general condition and the material of which it is built considered, as well as its dimensions. A carpenter or builder can readily give a fair estimate on what a new building of same dimensions would cost, when deductions can be made for the age of the building, repairs needed and essentials lacking.

Where a shop has machinery, take an inventory of same and make an estimate of the worth of the tools, or obtain their cost when new by writing the manufacturer.

The good-will of a shop or the trade it has is often a matter of conjecture or an unknown quantity to the prospective purchaser, especially where he is buying a shop away from home. A well-equipped shop generally has a good custom, but at the same time the purchaser may state that he does not particularly care to pay much for its good-will for the reason that he thinks it is included in the price or that he himself is able to command plenty of custom.

The worth of the ground should also be carefully considered. In the cities it may be priced by the front-foot, while in the country it could be bought by the acre at a low figure. The situation or location of the ground may also have considerable to do with setting its value, aside from its smithing use, *i. e.*, it might sometimes represent a higher value for other use, by the town growing or business centering near it. Where the ground is low, a high foundation is generally necessary to keep the shop dry, while on high ground. little foundation is needed. These are points to consider when buying ground on which to build.

The terms of sale should be closely scrutinized. Some sellers harp considerably on selling cheaper for cash, their main reason being, probably, that they want to use the money at once, yet they will often offer to sell on time at a higher price, notwithstanding that a mortgage on their own building ought to be a good investment. Where they offer to sell both ways they can sometimes be pinned to the lower price on different terms by disagreeing with them as to the deviation when the one way would be as profitable to them as the other. They might have to invest their money, anyway, were they paid all cash, and a mortgage on their own shop ought to be good protection as well as a good investment. Where the owner insists on al. cash it might be well to offer within two or three hundred dollars of it, or to split the difference.

Where another smith is bought out it is usually well to make a contract with him that he will not again engage in the smithing business in the same town or county. A competitor's shop is easiest bought by having some disinterested outsider or stranger approach him or act as agent, without letting him at

(*a*) ***THIS MEMORANDUM OF SALE,*** *made this ....day of................1904, by and between B. J. Jones and John Doe both of the city of ....;*

(*b*) ***WITNESSETH:*** *That the said B. J. Jones hereby agrees to sell, and the said John Doe agrees to purchase lots numbered..........on.................Street, in the city of....................county of................ State of.....................;*

(*c*) *That the said John Doe hereby agrees to pay the sum of ....Dollars for said premises;.............. dollars being hereby paid into the hands of J. W. Thomas in escrow until the completion of this contract, and the further sum of ....dollars, to be paid upon the making, executing and delivering of a general warranty deed by said B. J. Jones and his wife;*

(*d*) *That the said B. J. Jones is to furnish said John Doe an abstract to said property showing clear title in him;*

(*e*) *That the ....dollars paid by John Doe is to be returned to him in case title should prove defective to said property, but if the title to said lots is perfect and the said John Doe should refuse to carry out his part of this contract or pay the balance of said ....dollars due thereunder, then the..............dollars paid in escrow as aforesaid, to be forfeited to said B. J. Jones as liquidated damages;*

(*f*) *That this contract is to be fully executed and completed by both of the parties hereto, on or before the.......day of .... 1904.*

(*g*) ***IN WITNESS WHEREOF,*** *we have hereunto set our hands this .... the date first above written.*

B. J. JONES.
JOHN DOE.

first know who the real purchaser is.

To carry out the above named suggestions might not take more than an hour, and having decided to buy, a small payment down should be made—the least the owner will accept—say from ten to fifty dollars, to hold the sale. At the time of the payment, however, an understanding should be had as to the purpose of the deposit. In reality it is to forestall others from buying for a certain time, pending the examination of the title to the property. As a rule, the buyer tries not to bind himself absolutely while preventing the seller from backing down or selling to another. He can do this best by making a memorandum agreement with him.

The agreement here drawn is a simple form of contract of this kind. Referring to the reference marks, the clause marked "A" gives the date of the contract, the names of the parties and the place where they reside.

(B) Shows which of the parties is the buyer or the seller, while the property itself is definitely described or located.

(C) The purchase price and the amount paid down. J. W. Thomas is a third party, who holds the binding money. Note that Jones, together with his wife (he being married, she is a joint owner), is to give a warranty deed—which is the best.

(D) Besides furnishing a deed, Jones is to furnish an abstract showing clearly that he really owns the property legally and that it is free from any complications or incumbrance.

(E) Should the buyer refuse to buy he forfeits his money-deposit, or if the title is defective, then his deposit is returned.

(F) The time in which the transaction is to be completed. Were this omitted, either party might soon say that he was losing money by waiting, and annul the contract.

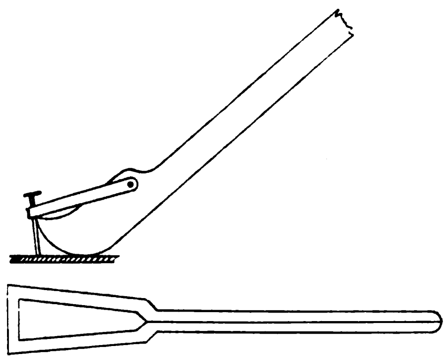
(G) The contract must be signed by both parties. It may also be witnessed, although the contract would be valid were it not.

It sometimes happens that the buyer knows all about a property so far as its excellent location is concerned, its advantages, worth, etc., in which case he might buy it outright of the owner by making a "General Warranty Agreement" with him, which contains the same wording as to the property as would the deed. Such contracts are usually on a printed form, with blank spaces for the insertion of the elements relating to the parties, description of property, etc. Modifying elements may also be inserted, particularly a clause that the owner is to furnish an abstract of title showing that the property is legally and technically vested in him, when the balance due over what was paid down as binding money will be forthcoming upon the tender of a warranty deed.

In order to transact the business to best advantage, it is well to employ a good attorney, who can draw the memorandum, look over the abstract and see that any errors are rectified or that the buyer gets a good title and a warranty deed.

The next number of THE AMERICAN BLACKSMITH will contain a continuation of the present article, entitled, "Abstracts, Deeds, Mortgages."

Where rent is exceedingly cheap there



A HANDY BOLT PULLER AND A TIRE BOLT WRENCH.

need be no rush about buying a shop, but when it amounts to $10 or more per month, it only takes from six to ten years to pay out in rent an amount which would buy a fair-sized shop. Owning a shop usually makes the smith take pride in it. The apprentice who has completed his trade will do well to save his money towards making a part payment on a shop.

The same general suggestions about buying a smithshop also apply to buying a home. Sometimes a shop can be bought which has desirable living rooms over it.

A word of caution: Don't be afraid to go in debt one-third or one-half the price of the shop, but where your means are very limited or you are getting old, don't go too deeply in debt, as, for instance, by buying a high-priced building. In the start, many a smith has bought a cheap lot and built a common shop or bought an old barn or building and converted it into a fairly good smithy, afterwards buying a better location or a well-equipped shop when he was better able to do so.

Bolt Puller—Tire Bolt Wrench.

J. MARION.

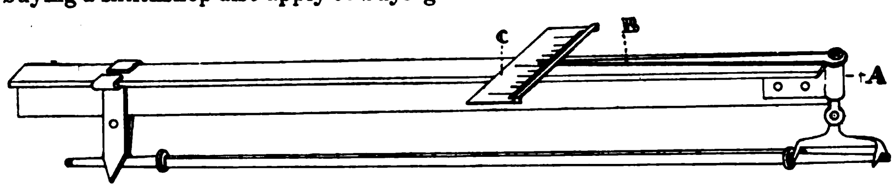
The accompanying sketch shows a tire bolt wrench, one-third size. I find it one of the handiest tools I ever made. The upper sketch is of a spike, nail or bolt puller. I will guarantee it to pull any spike or bolt, if made as shown. I hope some brother of the craft will try both of them and let us know how they work.

A Gage for Accurate Axle Setting.

NELS PETERSON.

A number of axle gages and devices for setting axles have been illustrated and described recently, some of them too crude to be of much value, others so complicated as to involve an array of figures and mathematical problems to be worked out. Although there is a large number of good devices on the market to be used for setting axles, no one has come forward with a description of one that would be of any practical use where quick work is required. Suppose, for instance, a man had to weld and set fifty sets of axles for a day's work; he would feel like retiring for the night if he had to put the wheels on the spindles, measure with rods, etc., to find out if his axle were set right.

The figure herewith shows a gage used largely in factories, and it is so simple that any good smith could make one. The main part could be made out of a piece of T bar; the head, A, is forged out and riveted on the bar. When the gage is in use the axle is laid with one end resting on the anvil, the other end on a trestle or some other



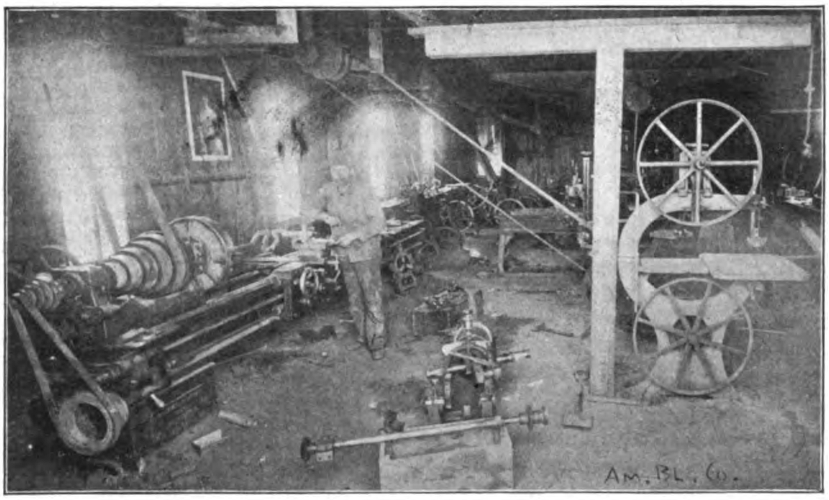
AN ACCURATE AXLE GAGE.

object. The gage is then set on the axle, as shown in the figure. Now, if the axle is perfectly straight and you revolve it, the indicator, B, will point to the center of the plate, C, which is laid off into half and quarter inches, etc., the indicator being about twenty inches long, or the average length of a buggy spoke. You can tell exactly the amount of pitch or gather your axle has by simply watching the point of the

indicator as it moves on the plate while you revolve the axle. I think brother craftsmen will find this a quick method and also very simple.

A Nebraska Shop for General Work.

The photograph shown herewith illustrates part of the shop of Mr. Edwin A. Stone, of Ong, Nebraska. In this room he has an engine lathe, 24-inch swing, 16-foot bed; one lathe of 13-inch swing and 10-foot bed; a 32-inch band saw, metal planer, power hack saw, and emery grinder with one wheel to grind tools and the other side with an adjustable table to do surfacing. Then there is a power screw cutting machine; Little Giant No. 10, which will cut solid iron rods to one inch and pipe to 1½ inches. His Universal tenoning and boring machine will drill holes in iron to ½ inch, and bore hard wood to 1½ inches, and has bored all the holes in a 4 x 4 oak rake axle, changing the bit twice in ten minutes by the use of cone pulleys. The speed can be changed four times which makes it better for different sized holes. There is also a jig saw, and last but not least a tire bolting machine for taking off and putting on nuts on buggy wheels. To one side is a room 16 by 18 feet, where is stored heavy material, round steel to three inches, flats and squares, pulleys, etc., gasoline and machine oil. Upstairs, wagon and buggy woods, oak and hickory lumber, heavy sheet steel for engine stacks, pipe, etc., is kept. In the blacksmith shop is a disc sharpener, and emery stand for plow work that will run two 14-inch wheels. A drill, hammer and blower, all run by power. The forges are made by the Buffalo Forge Company, of Buffalo, N. Y. The anvils are the Hay-Budden make, weighing 250 pounds. There are also two shears, one down on the floor for long heavy bars, the other a combined Black Giant Punch and Shear. Also several tools such as tire bender, mandrels, swage blocks, etc. Mr. Stone says, "I think machinery pays, and I keep getting more as fast as I can. For power I have a gasoline engine of four horse-power, which is rather small now, but which was plenty large enough when I bought it. Any one getting an engine wants to be sure and get one large enough at first, as it is a great deal of work and expense to change. As for foot and hand power machinery for practical business, I do not think it is much good, as a band saw cutting 2 or 3-inch oak makes business for a four-horsepower engine. I ran a 13-inch lathe with my feet a year and found it rather tiresome."



A FOUR-HORSE POWER GAS ENGINE RUNS THIS NEBRASKA SHOP.

Two Useful Devices for the Repair Shop.

FRED H. WOOD.

The sketches shown herewith are of two devices I have found very convenient. The first, Fig. 1, is intended to keep buggy tongue or shafts from slipping off the trestle while ironing or repairing. Make the Y-shaped iron with ⅝-inch stem and ½-inch branches. Weld a collar to the stem 2 inches from the crotch. Bore a row of holes in the trestle to accommodate different widths of work. I am indebted to Mr. Evans, of Callaway, Neb., for this idea.

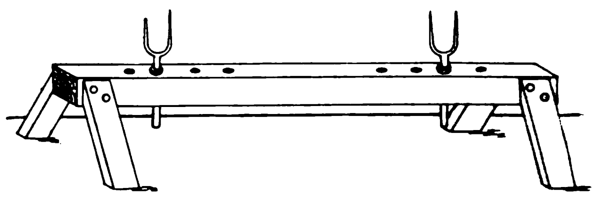


Fig. 1.—A SHAFT HOLDER.

Fig. 2 shows a tool to mark the hole in the landside point of a slip lay. It should be made of flat spring steel light enough to spring with the hand. The blunt plug should be ⅜-inch and the sharp one should be hardened like a center punch. To use, hang up the plow by the clevis. Place lay in position and blunt plug in hole in the frog of plow. Spring together with left hand. Hit a tap with hammer on center punch and your lay is marked on the outside and in the right place.

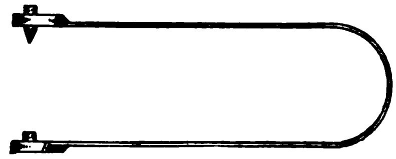


Fig. 2.—A TOOL FOR MARKING THE HOLE IN A SLIP LAY.

Wheeled Blacksmith Shop for Use in Battle.

A blacksmith shop on wheels for repairing cannon, gatling guns, gun carriages and everything pertaining to the artillery is the latest addition to the United States army. In the heat of battle, when artillery pieces become impaired from any cause, the movable blacksmith shop is ever in readiness to make speedy repairs, that the guns may quickly resume their work of death.

The wheeled shop is called a battery wagon. The United States is the only nation in the world to possess such an acquisition, and its service in actual warfare will be of inestimable value. In every battle that has been fought with artillery since the cannon ball's deadly work first was known, there has been a crying need for just such an octrivance, but it remained for an American to think out the conception and perfect the invention. How many times has an army been weakened through the disablement of its artillery? How many times has a general been forced to surrender because his cannon were no longer of service? History records many instances, and there are probably many more that have never been chronicled. With the battery wagon to have hurriedly placed the disabled artillery again in action history might tell a different tale in its accounts of numerous battles and it might have changed the fortunes of wars.

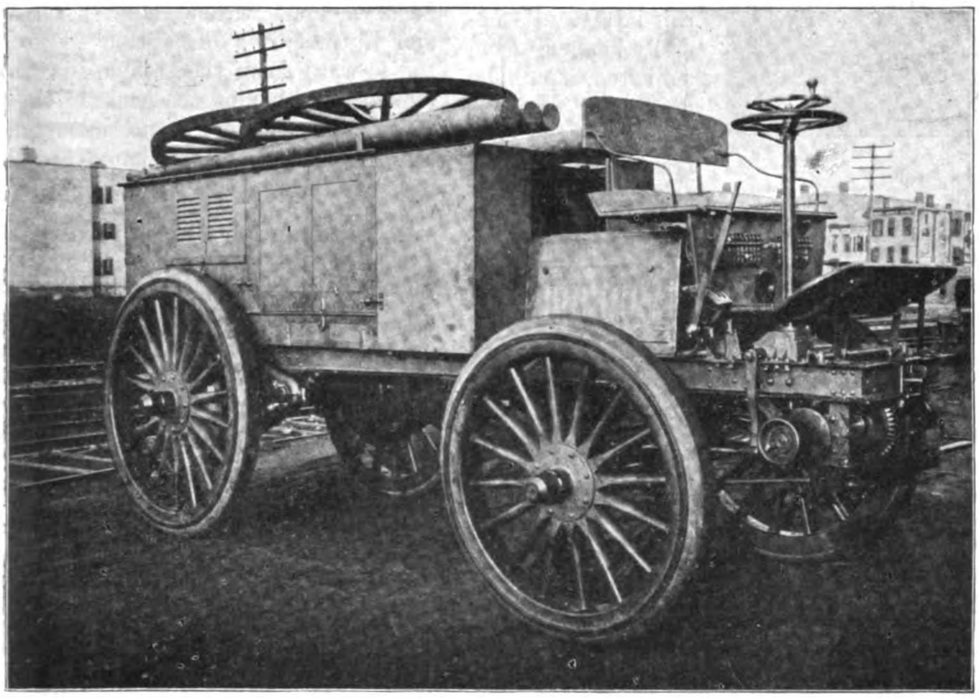
The battery wagon might be called

an army automobile blacksmith shop. It is a huge automobile equipped with all the tools of a blacksmith shop needed for artillery repairs. There is an anvil, a forge, a lathe, emery wheel, grindstone, vise, dynamo for lighting at night and other service, and an abundance of other tools, including hammers, wrenches, files, etc.

The wagon was built for the United States government by the United States Long Distance Automobile Company. It weighs about five tons and is driven with a four-cylinder gasoline engine. The front wheels are 48 inches in diameter and the rear wheels are 56 inches. All the wheels are fitted with solid rubber tires. The machine has four speed changes forward and reverse, and is geared to run at a maximum speed of about 10 miles per hour. It is arranged with drawers and compartments to carry all the small tools and appliances.

The machine attracted great attention when it recently traveled from New York to Washington, making the trip without a single mishap. All along the route people gathered to see it and to marvel at its unique appearance. European publications have sent representatives to America to describe the device, and the probabilities are that it will be imitated by many nations and become an established addition to all armies of the world. The most peaceful citizen can see the necessity of a moving blacksmith shop of this type. It will possibly be the means of bringing the blacksmith, as a hero, before the nation, as it places him upon the field of battle.

We are indebted to Popular Mechanics, Chicago, for the above description and illustrations.



AN AUTOMOBILE BLACKSMITH SHOP FOR USE IN BATTLE.

Diseases of the Foot—Causes, Symptoms and Treatment.

W. O. JULIUS.

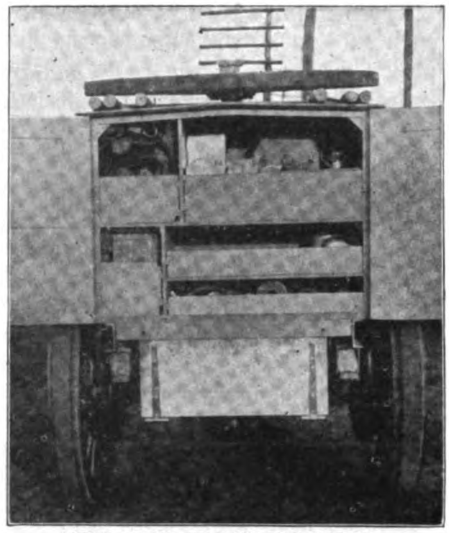
The foot of the horse is the most important part of the animal, inasmuch as this member is subject to many injuries and diseases which render him partially or wholly unfit for the labor which is expected of him. Since the value of the horse depends upon his ability to labor, it is essential that his organs of locomotion should be kept sound, and to accomplish this it is necessary not only to know how to cure diseases to which these organs are liable, but better still, how to prevent them. Of importance to the detection and cure of disease is a knowledge of the construction and uses of the parts which may be affected. But presuming that the readers of THE AMERICAN BLACKSMITH are familiar with the general structure of the foot, ankle and fetlock, we will not go into details about their conformation.

Faulty Structure.

We will start with a condition known as *flatfoot*, which is common to heavy breeds and those raised on low marshy soils. It is confined to the forefeet, which are generally broad and low-heeled and with a wall less upright than seen in the perfect foot.

In flatfeet there can be little or no elasticity in the sole, for the reason that it has no arch, and the weight of the animal is received on the entire plantar surface as it rests on the ground instead of on the wall. For this reason such feet are particularly liable to bruises of the sole, producing corns and pumice sole.

Horses with flatfeet should be shod



REAR VIEW OF BATTERY WAGON.

with a shoe having a wide web pressing on the wall only, while the heels and frog are never to be pared. Flat feet generally have weak walls and as a consequence the nails of the shoe are readily loosened and the shoe cast.

Clubfoot is a term applied to such feet as have the walls set nearly perpendicular. Where this condition is present, the heels are high, the fetlock joint is thrown forward and the weight of the animal is received on the toes. Special shoeing, as a rule, is the only measure of relief that can be adopted. The toe should not be pared, but the heels are to be lowered as much as possible, and a shoe put on with a long toepiece projecting slightly upward, and the heels are to be made thin.

A condition known as *crooked-foot* is where one side of the wall is higher than the other. If the inside wall is the higher, the ankle is thrown outward, so that the fetlock joints are wide apart and the toes close together. Animals with this deformity are pigeon-toed and very liable to interfere, the inside toe striking the fetlock. If but one foot is affected, the liability of interfering is still greater for the reason that the fetlock of the perfect leg is more near the center.

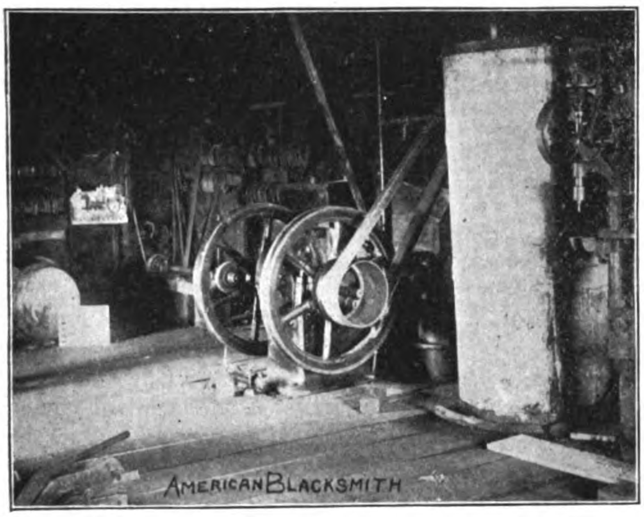
When the outside heel is the higher the ankle is thrown in and the toes turn out. Horses with such feet interfere with the heel. If but one foot is so

affected the liability of interfering is less than where both feet are affected, for the reason that the ankle of the perfect leg is not near to the center. Such animals are especially liable to stumble and go lame from injury to the ligaments of the fetlock joints.

The deformity is to be overcome by such shoeing as will equalize the disparity in length of the walls and by proper boots to prevent the fetlock from interfering.

Interfering.

An animal is said to interfere when one foot strikes the opposite leg when the animal is in motion. The inner surface of the fetlock joint is the part most subject to this injury, although under certain conditions it may happen to any part of the ankle and may cause lameness, dangerous tripping and thickening of the injured parts. Faulty conformation is the most prolific cause, when the bones of the leg are so united that the toe of the foot turns in or when the fetlock joints are close together and the toe turns out. When the leg is so deformed that the whole foot and ankle either turn in or out, interfering is almost sure to follow.



A GAS ENGINE IN AN IOWA SHOP.

The evidences of interfering are generally easily detected, as the parts are tender, sore and swollen, but very often, especially in trotters, the flat surface of the hoof strikes the fetlock without evident injury and attention is directed to this part only by the occasional tripping and unsteady gait. In such cases proof of the cause may be had by walking and trotting the animal after painting the inside toe and quarter of the suspected foot with a thin coat of chalk, mud or paint.

In treating for interfering it may not be possible to overcome the defect when the trouble is due to a deformity. In such cases and as well in those due to exhaustion and fatigue, the fetlock or ankle boot must be used. In many instances interfering may be prevented by proper shoeing. The outside heel and quarter of the foot or injured leg should be lowered sufficiently to change the relative position of the fetlock joint, by bringing it further away from the center plain of the body, thereby permitting the other foot to pass without striking. A very slight change is often sufficient to affect this result. At the same time the offending foot should be so shod that the shoe may set well under the hoof responsible for the injury and the shoe should be reset every three or four weeks.

Cold water bandages applied to the injured parts will remove soreness and swelling when the cause has been removed, especially in recent cases.

Sprains of the Fetlock.

This trouble is most common in the forelegs and as a rule affects but one at a time. Horses doing fast work and those that interfere are particularly liable to this injury. It generally happens from a misstep, stumbling or slipping, with the result that the joint is extended or flexed to excess. The same result may happen when the foot is caught in a rut or car track and the animal falls or struggles violently.

The symptoms of sprain of the fetlock vary with the severity of the injury. If slight there may be no lameness, but simply a little soreness, especially when the foot strikes on uneven ground and the foot is twisted a little. In cases more severe the joint swells and is hot and puffy and the lameness so intense as to cause the animal to hobble on three legs. While at rest the leg is flexed at the joint affected and the toe rests on the ground.

If the injury is slight, cold water bandages and a few days' rest are sufficient to effect recovery. Where there is intense lameness and swelling the legs should be placed under a constant stream of cold water and when the inflammation has subsided a blister should be applied to the joint.

In some cases, especially in old horses long accustomed to fast work the ligaments of the joints are ruptured in whole or part and the lameness may last a long time. A joint once injured by a severe sprain will never entirely regain its original strength and is ever after liable to a repetition of the injury.

Overreaching.

This is where the shoe of the hind foot strikes and injures the heel or quarter of the forefoot. It very rarely happens except when the horse goes fast, and is therefore most common in trotting and running horses. In trotters the accident generally happens when the animal breaks from a trot to a run. The outside heels and quarters are most liable to the injury.

If an animal is subject to overreaching, the coronet at the heel or quarter is generally bruised or cut, the injury in some instances involving the horn as well. When the hind foot strikes well back on the heel of the forefoot the shoe may be torn from the forefoot or the animal fall to his knees.

If the injury is but a slight bruise cold water bandages applied for a few days will remove all of the soreness. But if the parts are deeply cut it is well to poultice for a day or two, after which cold baths may be used.

When an animal is known to be subject to overreaching he should never be driven fast without quarter boots, and if there is a disposition to grab the forward shoes the trouble may be remedied by having the heels of these shoes made as short as possible while the toe of the hind foot should project well over the hind shoe.

A Blacksmith Shop of Iowa.

JNO. F. PINNE.

The photograph herewith is that of my shop located at Otho, Iowa. I run my emery stand, disc sharpener (which is a Champion), grindstone and drill with my five-horsepower Lewis engine, which I consider one of the best engines on the market. This is manufactured by the J. Thompson & Sons Mfg. Co., of Beloit, Wis. I intend shortly to put in more machinery. My work is that of repairing plows, cultivator shovels, etc., horseshoeing, wagon work, and painting buggies. I started my shop in Otho five years ago. Up to this time they could not keep a smith, as they claimed there was not enough work for a man in the town. However, I have all that I can do at the present time.

The following are some of our prices:

Horseshoeing, plain	$1.20
" toed	1.40

Re-setting shoes plain	.50
" " toed	.70
Setting axle	1.00
Welding springs per weld	.25
Wagon tongue	1.50 and 2.00
Wagon hounds front	3.50
" " hind	2.50
Axles	2.00 to 3.00
Buggy shaft	1.00
Buggy spindles new	5.00
Setting tires	.50 to 1.00
Singletrees per pair	1.00 to 2.00
Filling Wheels	3.00
Spokes new	1.50
Rims new	1.50
New tires per pound	.03
Making new tires	1.00

Of Interest to Progressive Smiths.

The progressive smith, who is taking time by the forelock and figuring on some advertising scheme for the first of the year, will be interested in the announcement on page XV., of this issue. It sets forth a good opportunity for advertising the smith shop.

QUERIES ANSWERS NOTES

The following columns are intended for the convenience of all readers for discussions upon blacksmithing, horseshoeing, carriage building and allied topics. Questions, answers and comments are solicited and are always acceptable. For replies by mail, send stamps. Names omitted and addresses supplied upon request.

Fistula.—I have a horse that has the fistula and I have tried everything that I can think of, but cannot effect a cure. I would like a few hints on curing same. Can some brother smith give me a remedy? H. W. Simon.

A Pacing Horse.—I have a horse to shoe which paces and sometimes trots, but seldom. He always paces in front of a wagon. I would like to ask some brother smith if the horse could be shod so he would not pace. Wm. Hollenberg.

Cells for Engines.—Will some reader of The American Blacksmith give me information as to the best cell to use on an engine, wet or dry? Also how many cells per horse power, and the names of cells being used. M. I. Morgan.

Good Locations for blacksmith shops exist at the following four places. There is no shop at any of them at the present time. For further information address the postmaster, Sims, Center, Flusher and Farmington, all in North Dakota. There is no shop within 22 miles of Center.

With Regard to the Anvil.—I think I can go Carl Bereuter one better on his anvil. If he should have to work on Sunday and wishes to be quiet about it, he should just wind a chain around the waist of his anvil and it will not be in the way like the weight on the horn. H. N. Pope.

Shoeing a Club-Foot.–Answering Brother Smith as how to shoe a club-foot, will say when cutting the hoof don't pare the toe, but lower the heels as much as possible and put on a shoe with a long projecting toe piece, slightly turned up. Make the heels to this shoe thin. O. B.

Softening Hard Feet.—In answer to C. R. C.'s question how to soften hard feet in summer, will say, when shoeing, pack the hollow of the hoof with cotton waste dipped in pine tar and shoe with a leather pad to keep waste in hoof. Painting the outside of hoof with pine tar will help in this treatment. O. B.

An Unusual Shoe.—In answer to Martin Kaffitz, would say that the shoe he asks for was made here in Shelton but later the firm moved to New York. I have often been in the factory and have also put on a good many of them, but do not consider them any better than any well fitted steel shoes, unless for use on very hard pavements. H. N. Pope.

A Raise in Prices.—The smiths of Brighton, Ontario, together with others in that vicinity, have adopted a new set of prices, as follows:

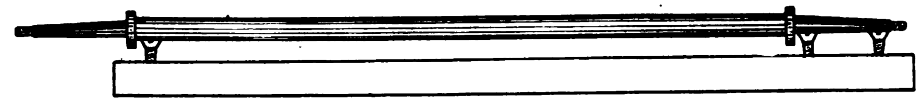
Resetting shoes, each	.10 to .12½
New shoes, each	.25 to .30
Bar shoes and specials	.50 to 1.00

I may say these prices are working all right. W. Ferguson.

Mixing Clay for the Forge.—In answer to A. H., in the August number of The American Blacksmith, would say the clay is already mixed. Get good clay, free from pebbles and pound it to place with a large hammer, but don't use water. He will find this will make a fire place that will last for years without any repairs. I have used mine for over four years. Be sure and get it deep, as a shallow fire is a great mistake. Seven inches deep, at least. Wm. Angle.

Axle Setting.—I have been at the anvil for fifty years and have tried all the known rules for wheel and axle work, and have adopted what has by experience proved to give me the best results, letting all the rest go.

Now as to wheels, the plumb spoke theory is all right where there is but little dish in the wheel, but where there is considerable dish the theory will not do. It is often the case that there is considerable more dish in the back wheels than the front. Consequently if you make the wagon or buggy track you have too much swing in the back wheels. There is always a remedy, if we will hunt for it, and therefore if we are to made a carriage of buggy track and run right we will have to go to the axle. There seem to be so many rules and theories for setting an axle, that younger smiths become confused as to what is right and what is wrong. Having tested all the rules that I ever heard of, would say that the one I now use has given the best results of them all.



A SIMPLE DEVICE FOR SETTING AXLES.

Suppose we have a one-inch axle. The right end I set according to a straight line running from the top of the axle at the left collar to the bottom of the axle at the right collar, giving the axle pitch till its bottom lies along this line. I use a straight edge for this. Then I take a straight edge and put three screws in it, one at the left to come just inside the collar, the other two at the right, at end and collar. See illustration. Adjust the screws so as to have all three touch axle and then set axles by this gauge. The result is that you have an easy running buggy or carriage. This rule applies only to iron axle work, not to wood.

As to track, some wheels have more dish than others. Suppose the back wheels have one inch more dish than the front. If you set your axles both alike, the back wheels will track one inch wider than the front. Where is your remedy? Some say to set the back axle down at point until it does track. That is a mistake. Set your axles all alike by the gauge and take the difference of dish out of the axle. If I find one inch more dish in the back wheels than in front, I make the axle one inch shorter. You will then find that your job will track all right, look all right and run all right.

I would say further that when you use axles that are over one inch, say 1¼ or two inches, do not use the depth of axle, as in the figure, but from 1 to 1¼ inches will do very nicely. S. H. R.

Hardening Small Rolls.—I should like to know of some way to harden small rolls for roller bearings. I have tried heating them in a furnace and then dipping in melted cyanide and afterwards in a barrel of brine, yet they do not seem to get hard enough. I am expected to make them so hard that a file will not touch them, for after three or four-thousandths are worn off them we have to throw them away. Can some craftsman give me some mixture into which I could dip them so as to give satisfaction? Charles R. Hussey.

Bar Shoes.—Answering Jack's inquiry as to the easiest way to make a bar shoe, would say, turn a shoe in the usual manner, leaving the heels a little longer than on ordinary shoes, get the length, thin down the heel, turn and fit, getting it a little narrower than it should be, then weld, finish up and fit to frog as needed. I have seen a good many made quickly and in a first-class shop at that, by taking an ordinary shoe and welding a straight bar across the heels. H. N. Pope.

Hardening Plow Lays.—In reply to L. L. R., in the July issue, in regard to hardening plow lays without warping, will say, use the hardening compound advertised in the July issue and your trouble will be ended. Of course, heating the lay and mode of plunging in water have also a good deal to do with warping, as a plow lay has to be heated uniformly and then plunged straight down in the water. Brother Black's method seems too antiquated to use in these days of progress. A. Z.

A Gas Engine Query.—I would like to ask the advice of my brother smiths about putting in a gas engine. I have a general shop, doing a good deal of shoeing, wagon repairing and ship work, but no wood work on wagons. In the ship work I could save myself a great deal of hard work in punching heavy material, such as chain plates, block straps and mast head irons, but I do not know if it would pay to put in an engine. I also make a great many knives for fishermen, that is, splitting knives and double-edged throaters. I made twenty dozen for one man this spring. I suppose I could use an emery wheel to finish these if I had an engine. John Day.

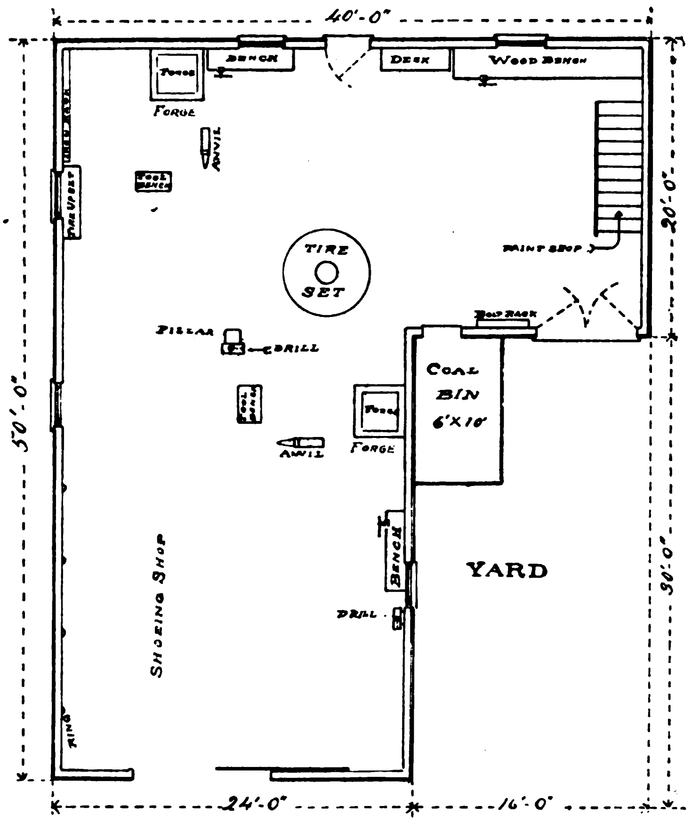
A Painting Query.—Can some experienced painter tell me how to paint a Duplex wagon, 1¼ gear, body plain, but with two rails. I have lots of them to build in competition with others, and want to turn out a superior wagon to get the business. I want

to know a good and cheap formula to paint, stripe, varnish and ornament the body to make it attractive; also want my name on as maker. I prefer red gear and green body, or yellow running gear and red body. CHAS. D. BRIDDELL.

A Texas Letter.—Desiring to have a planer for my shop, and not being able to buy one already rigged up, I would like to know where I can get a mandrel pulley, two boxes and a knife or blades. I will then be able to make the rest. I will then have the best furnished shop as well as the best shop in the county.

With a six horsepower gasolene engine I run a dynamo and furnish light for the business part of the town of Meridian. I have a trip hammer of my own make, a four-fire fan, emery, drill, band saw, spoke machine and rip saw. My shop is of stone and is 27 by 100 feet. CLAY FRANCIS.

Paints.—Will some one tell me about mixing paints or using colors? Say, for instance, I want to lay on the color for a buggy after it has been filled and primed. I want to use drop black ground in linseed oil or vermilion in oil. Now what proportion of Japan drier should I use after the color has been thinned with spirits of turpentine? Too much will make it crack and chip, while too little will make the varnish pull. What is the right amount? J. W. JOHNSON.



PLAN OF A CANADIAN SHOP.

In Reply.—In mixing paint, do not use linseed oil in your vermilion as it darkens it and destroys its brilliancy. The same is said of Japan. Coach black ground in Japan should have a binder of varnish instead of oil and thinned with turps, so as to spread easily under the brush. WALT.

Plans of a Canadian Shop.—As I have never noticed the plans of a Canadian shop in THE AMERICAN BLACKSMITH, I think the plans of my shop shown herewith will compare favorably with any which I have seen. It is L-shaped, the back part sixteen feet high, which makes a good paint shop. I run my work to and from the paint shop, up over the coal bin. Everything is a great deal more convenient than it appears. I have just put in a Henderson cold tire setter. Have been at the craft for forty-five years. DAVID CALLANDER.

Curing a Seedy Toe.—In answer to Brother M. L. Chunn's inquiry in the June number of THE AMERICAN BLACKSMITH, regarding a mule with what we call seedy toe, I will give my experience with one in which I could run the whole length of a barlow knife handle under the shell of the foot. Could get but one or two nails in the heel, so I set the foot on a block and took a chisel and commenced at the side where it was loose and went straight over to the other side, cutting off all the horny substance of the hoof that was loose. I then put on a light shoe, without a toe, to protect the hoof, and had to change the shoe about every two weeks for a couple of months and then it stayed longer. I did this in 1897 and the animal has as good a foot now as ever was on a mule. It goes barefoot now, and before I did the above it had to have a shoe on all the time. The hoof was all right in about eight months. If Mr. Chunn wants references as to what I have written, I will give him same upon application.

W. M. COOPER.

A Hardening Compound.—In the July issue the following formula for hardening shovels appears: "Two parts cyanide of potassium, one part carbonate of potash, one part of bicarbonate of soda. Mix and pulverize and apply." The writer never heard of the compound before and is led to infer that the brother smith who offered the same is not a chemist. I feel positive that the compound would not be of much value for the purpose set forth. Cyanide of 'potassium is made from ferro-cyanide of potassium and in the process of transforming from one to the other the hardening qualities are about set to one side. The carbonate of potash and the bicarbonate of soda are superfluous. Ferro-cyanide of potassium, also known as prussiate of potash, is an animal potash made from horns, blood, leather, etc., and is without question the most ready substance extant for the quick carbonization of iron. Pulverize it as per above, heat the substance to be carbonized and sprinkle the same thereon and allow it to be taken up by the metal. Re-heat and cool as usual. This form of potash is much used by file cutters by mixing the same with chloride of sodium (common salt) and placing the same in the water tank. It causes the files to become harder on the cutting sections. Its penetration is not more than one-hundredth of one inch. HIRAM STRIFF.

A Washington Letter.—I run my shop with a Reliance 2 H. P. gasolene engine. It gives good satisfaction and anybody will do well to get one of these engines. All the expense I have had in the two years is an extra igniter, so I can change when the igniter pins need new mica washers. By having two of them one is always ready on short notice. When the mica washers get greasy, just change igniters, which only takes a minute, and you are ready to start up again. It is the strongest engine I know of. Mine will run six of my machines all at once, and does it well. When your engine is shut down all expense stops, and the engine can be started in half a minute. I have the only shop here that is run by power and you bet I do the business. My man and I put on a set of tires, 1 x 5-16 in just one and one-fourth hours a few days ago.

I have a good trip hammer, which I made myself. Anybody starting up the way I did, without anything, six years ago, can make his own machinery, if he is a good mechanic. I also made my band saw and it works to perfection. To make machinery you must take pains and fit everything right and good so it will run smoothly. C. R. JAMERTHAL.

A Word About Prices.—I believe in doing good work and charging the price. Work in this town has been cut down to almost nothing, but at the same time was not worth much. The farmers from the neighboring towns come with their plows and other work and are glad to pay the price for good work. The following are the prices here:

Shoeing	.25 to .40
Steel plugged shoes	.50
Sharpening lister	.60
" " and hardened	1.00
Sharpening plow, 14 inch	.25
" " 16 "	.30
" " 18 "	.35
Sharpen and hardening plow	.50, .60, .70
Spokes	.20
Felloes	.20
Tires	.50
Welding Pitman	.50
" sickle	.50
Tongues	$2.50 to $3.00
Odd work per hour	.50

I run the best shop in the country, building being 26 x 56, two fires, gas engine, trip-hammer, planer, rip and cross-cut saws, drill and pressure blower, all run by power, and expect to put in lathe and shoeing stock soon. When I get these in I will send you a photo of the shop. J. W. POKORNY.

An Interesting Australian Letter.—No tradesman should be without THE AMERICAN BLACKSMITH. In fact it should be put into the hands of the apprentice as soon as he enters a shop, and through it he will be able to learn his trade quicker. I admire the way in which the paper is endeavoring to secure higher prices. Seeing brothers send in prices from different parts of the States, I thought I would send a few Victorian prices. There are few or no organizations in Victoria. Another mistake made here is the apprentice business. They stay in a shop about twelve months and leave on account of small wages. They receive about 62 cents and board. I think an apprentice should be given a fair wage to commence and then he will do better work. The prices here are:

Horseshoeing, four shoes, plain	$1.12
Resetting	.62 to .75
Calks and toes, four shoes	1.75
New toes, 1½ by ½-in., per pair	7.50
Heavy tires, 2½ by ⅞-in., per pair	11.25
Resetting heavy tires, per pair	3.00
Resetting light tires, per pair	2.00
Plow lays	1.25
Steel points	.25
Welding springs, each	.62
Welding and setting axles	2.50

I may state that in this country there are neither cold tire setters nor horse stocks.

Could some brother inform me how to ·emove rivet heads? The rivets belong to redge buckets and are all steel, from ½) ⅞ of an inch thick; some are counersunk and some are not. The counersunk ones cause all the trouble. If some rother can inform me of some tools or ome way to cut them off it will save a reat deal of trouble and I will be very auch obliged. M. QUINLAN.

Cold Tire Setting—I noticed in the ugust number an article under the heading old tire setting, signed August Runge, and a reply to the same will say that the above entleman is very severe in his criticism egarding cold tire setting.

I have a Henderson Cold Tire Setter that have been using for over three years, and e work the machine has done proves beond a doubt that this process is a success. have used my machine on both old and ew work. New wheels that have been set ith my cold tire setter have been in use for ree years without any of the tires slipping e least in all that time. I could send Mr. unge a hundred testimonials of customers r whom I have set tires, which would rove that the cold process of setting tires as given them the best of satisfaction. oreover a smith that understands the peration of a cold tire setter of the style I ave, will never dish a wheel out of the roper relation to the axle in order to main-in a plumb spoke, whereas, by the old way is almost impossible to prevent the wheel om dishing. Farmers, as a general rule, are rejudiced against smiths setting their heels, as they know by experience that ey will have their wheels dished. They sually do not have tires set until all the ints or felloes and shoulders on spokes ave worn so much that no smith can set e tire and prevent the wheel from dishing ore or less, but with the tire setter I can rew the wheel down solid and by applying e pressure, the spokes and felloes will all in up tight and the wheel will come out the machine solid with not the least more sh than it should have. Furthermore, I in prove that I have taken from two to ree inches of dish out of old wheels that ave been in constant use for several years id have held their shape. Some of my ices are:

ew shoes, old style, per four shoes..	$1.25
esetting shoes, per pair......	.25 and .35
everslip shoes, four calks, each......	.40
" " five " "	.50
etting tires........................	1.50
lling wagon wheels, each...........	3.00
ngle spokes.........................	.15
" felloes	.25
'agon tongue.........................	2.50
" axle	3.00
" bolster.........................	1.50
" hounds, each.....................	.75
iarpening plows......................	.20
iares, 14-inch.......................	3.00
ultivator shovel blanks, each........	.75
ointing plows........................	.50
ires, 1½ by ½-inch...................	7.00
uggy stubs, one-inch, per set.......	6.00
(50c. extra for every ⅛-inch larger per set)	
iarpening set of four cultivator shovels	.50

I think these prices are as good as the erage. ALBERT SCHUETZ.

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THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A.

A PRACTICAL JOURNAL OF BLACKSMITHING

JANUARY, 1904

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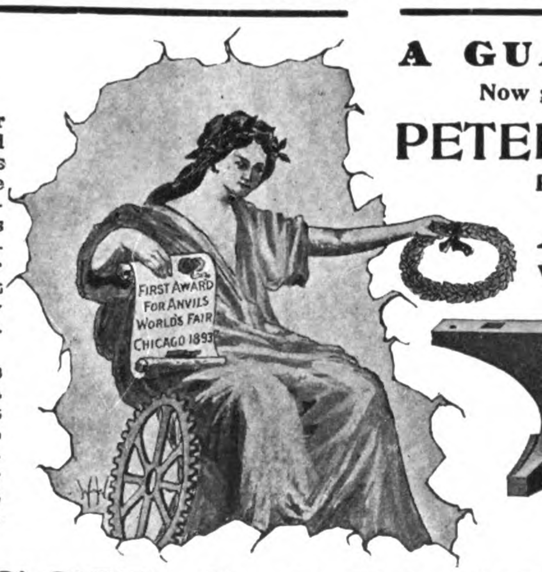
With Special Steel Face.

WHILE other makers recognize the Peter Wright as the Standard Anvil of the World by claiming that theirs is "just as good," this anvil has never before been warranted, for the reason that the makers cannot make a better anvil under a guarantee than they have always made without. The guarantee which will hereafter go with every Peter Wright Anvil is designed to satisfy the most exacting of customers.

If any inherent defect is hereafter discovered in a Peter Wright Anvil, report the nature of it to the dealer from whom you purchased it, or to your regular dealer, and he will see that your claim is promptly investigated.

You are cautioned in buying to see that each Anvil is stamped with the full Trade Mark on one side and has the Green Label affixed to the other. These celebrated Anvils may be obtained from all the

PRINCIPAL HARDWARE DEALERS.



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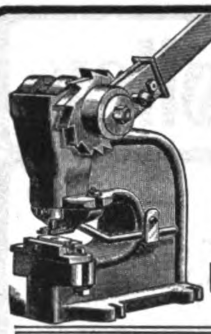
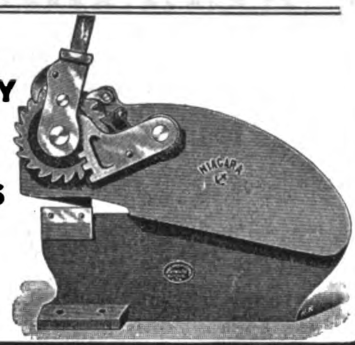
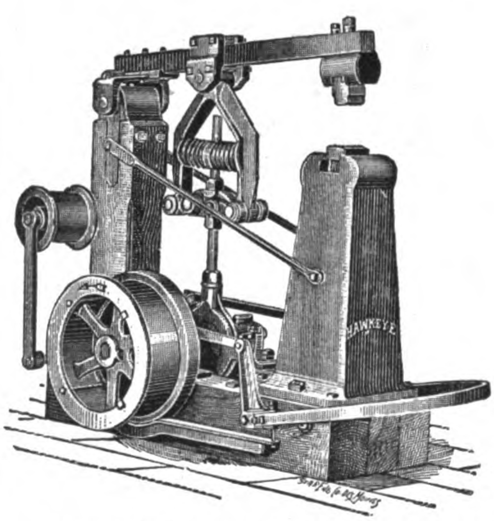
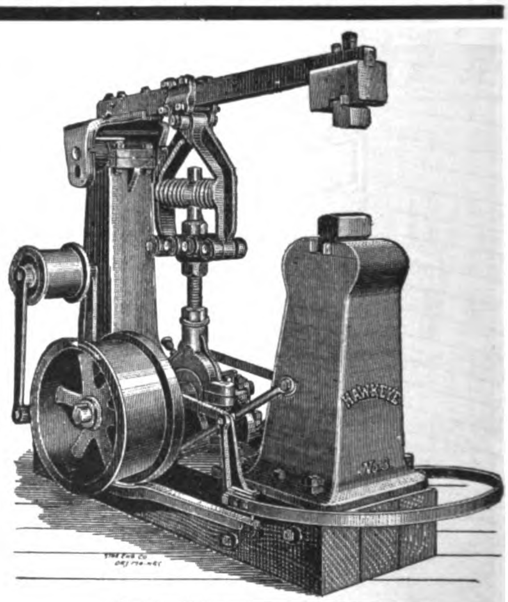
Agents for the Manufacturers. **9 to 15 Murray Street, New York City.**









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Want a Handsome 1904 Calendar?

WE WILL MAIL Single copies of this Calendar, in strong, paste-board tubes to anyone for 25 cents.

Send us $1.00 for a year's subscription to "The American Blacksmith" at once, and we will mail you our Beautiful Calendar free of charge. If you are a subscriber, the Calendar will be sent free if your subscription is paid up to February, 1904.

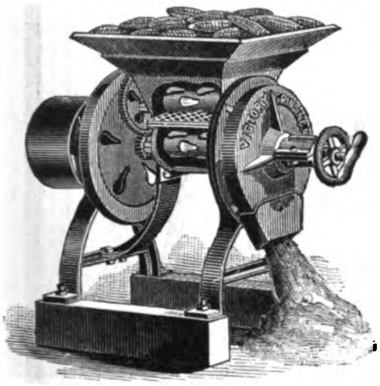
If you find a bill in this paper it should be paid promptly so as not to miss the Calendar.

The Calendar is 6¼ in. wide by 9 in. long, and handsomely finished in colors. It has been especially designed for our subscribers. The picture shows an exceedingly effective pose of a pretty society girl. It is taken from one of the finest paintings of the season.

There has been a large demand for the Calendar. The supply is limited. Send at once before it is too late.

DO NOT MISS THE BEST OF 1904 CALENDARS.

American Blacksmith Company, Drawer 974. Buffalo, N. Y.



ATTENTION!!

We want you to represent us in your locality, selling

The Victory Corn and Feed Mills.

OLDEST AND BEST GRINDING MILL MADE. ***STRONG, SIMPLE, DURABLE.***

Especially adapted to grinding ear corn, shelled corn, wheat, oats, rye, etc.

WRITE FOR PRICES AND PARTICULARS TODAY.

THOMAS ROBERTS.

(Established 1876.) **Springfield, Ohio.**

The "Little Sampson" Hammer

A Blacksmith's Helper

Patent applied for.

First-class Material, First-class Workmanship and a FIRST-CLASS HAMMER, at a price within reach of the humblest Knight of the Anvil on this Globe.

COLEMAN IRON WORKS COMPANY,
Elmira, N. Y., U. S. A.

LION BRAND

"LION BRAND"

LION BRAND

PATENT, ENAMELED AND FURNITURE LEATHER

T. P. HOWELL & CO. LEATHER ESTABLISHED 1840. NEWARK, N. J.

FOR CARRIAGE MAKERS, HARNESS MAKERS, AND FURNITURE MANUFACTURERS.

Established 1840

T. P. HOWELL & CO.

Newark, New Jersey.

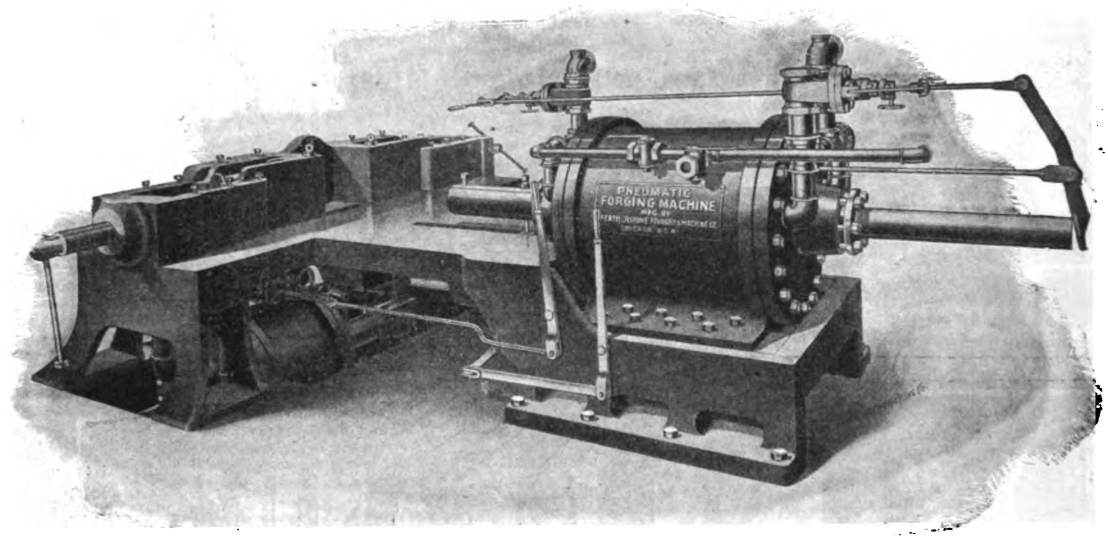
Established 1840

The Pneumatic Forging Machine

Is Built in Three Sizes as Follows:

SIZES	UPPER CYLINDER	LOWER CYLINDER	WEIGHT TONS	FLOOR SPACE
No. 1	16 x 22	16 x 14	6	11 ft. 7 in. x 9 ft.
" 2	20 x 26	20 x 16	9	13 ft 1 in. x 10 ft. 1 in.
" 3	24 x 31	24 x 18	15	15 ft. 2 in x 12 ft. 1 in.

Special Sizes Built to Order.



THIS machine is designed especially for car and locomotive construction and repair shops, and installed in these shops has effected a saving in turning out such forgings as valve yokes, rod straps, braces, hangers, pockets, equalizers, brackets, etc., etc., of from 40 to 90 per cent. The amount of work which can be turned out is limited only by the capacity of the furnaces. By reason of the fact that from three to ten minutes only is required to change dies, a great variety of work can be made. The cost of operation is small, two men only being required to operate the largest machine.

Send for catalogue fully describing the Pneumatic Forging Machine.

FEATHERSTONE FOUNDRY & MACHINE CO.

General Offices and Works

348 NORTH HALSTED STREET, CHICAGO, ILL.

Room 1606
No. 170 Broadway
New York City

Room 612
Fidelity Trust Building
Buffalo, N. Y.

WE WILL REPLACE ANY IMPERFECT KNIFE WITH TWO NEW ONES

Hand Forged Butcher Knives

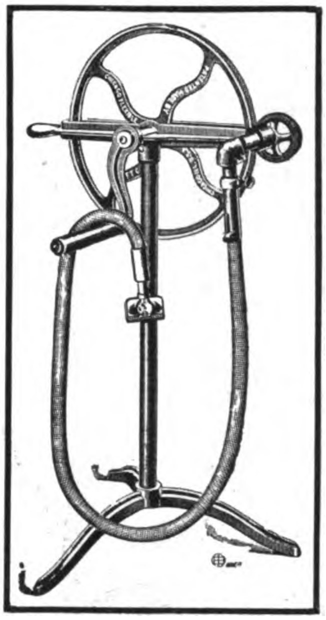
GROUND, Tempered and all ready for the handles, either round or riveted, for 15 cents each or $1.50 a dozen. All sizes from 5-inch to 8-inch. These blades are made from Sanderson Steel and warranted. They will hold an edge. Handles all ready to put on, one cent each. Hand Forged Razors, ready to use, 40 cents each; Pocket Knife Handles, in great variety, 10 cents. Try a sample. Hundreds of 'smiths are using these blades and make money and friends selling them. Liberal discount in quantities.

ADDRESS—

Woodworth Knife Works
Nunda, N. Y. Established in 1876

ALL OVER THE WORLD

The 1902 Chicago Clipper



Price, $10.75.

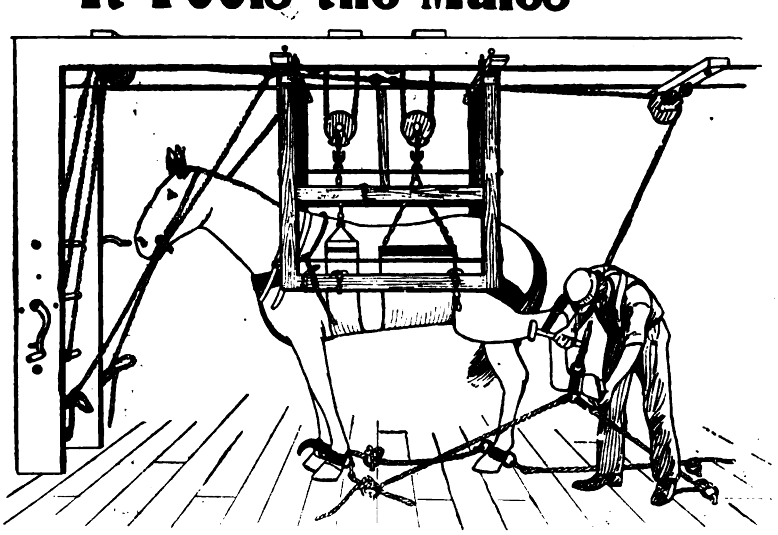
"Stewart's Patent" is recognized as the greatest clipping machine ever invented. More of them are sold every day ten times over than all other makes combined. Each one is sold under a positive guarantee to clip faster and turn easier than any other machine made, regardless of price, or money refunded. All gearing is cut from solid metal, and unlike any other machine made, it can be turned with either the right or left hand.

It's Easy Money

blacksmiths make using this clipper. Horse clipping is now a part of every up-to-date horse shoeing establishment. Why, look at the profit. You can clip a horse in 30 minutes with this machine, and every horse owner recognizes the advantages of clipping.
Send $3.00 and machine will be sent C. O. D. for the balance. Catalog on request.
Yours very truly,

Chicago Flexible Shaft Co.
186 Ontario Street, - CHICAGO.

"It Fools the Mules"



This shows the Martin Rack in position for clinching shoe on hind foot. It is the simplest rack in construction; easiest to operate, adjusting perfectly to largest or smallest horses, and can readily be placed in any shop.

Entirely out of the way when not in use, but ready at a moment's notice.

Neither rack, nor any parts interfere with or cramp shoer; feet are safely secured and it is impossible for animal or shoer to be injured.

No horse ever got out of a Martin Rack by parts breaking.

A Dangerous Risk of being crippled

And perhaps permanently disabled is taken by every horseshoer, who unprogressively continues to perform this difficult labor in the old ways;

And everyone acts against his own best interests

who persists in refusing to equip his shop for defying refractory horses by installing a

Martin Horse-Shoeing Rack

the perfect safeguard against danger, and practical aid in shoeing vicious and crippled horses. A Rack is a necessity and well-paying convenience.

THE MARTIN RACK

is the quickest, handiest and safest to shoe a mean horse in; one will last a life-time; the price is reasonable, less than ten cents a day, paying for one in a year's time. Consider your own danger and the injurious effect upon your health in trying to shoe wild horses without a rack.

Reflect upon your loss of trade and waste of valuable time by being without a Rack,

And acting upon your better judgment order this modern convenience, which will make your hardest work easy and rapid, and eliminate all danger. **The Martin Rack is Fully Guaranteed.** It is built right, and will do the work right, or money refunded.

SPECIAL THIRTY-DAY OFFER!

We have an interesting proposition to submit to every Horseshoer who writes us within the next thirty days. We intend to put money in your pocket right from the start. Don't delay, but send your request for this Special Offer at once.

You Run No Risk in ordering a Martin Rack, but you take dangerous chances in endeavoring to get along without one. Send today for Catalogue 27 and list of testimonials.

The Martin Horse Rack Co. SIDNEY, OHIO.

THE ONLY TOOL REQUIRED.

TO OPERATE THE BRADLEY SHAFT COUPLING

ONLY ONE HAND IS REQUIRED TO OPERATE THIS COUPLING.

No wrenches, hammers punches, patience or profanity, or anything but one hand is required.

Ten seconds is all the time needed to change from shafts to pole.

Less than Ten Seconds if they are only to be removed.

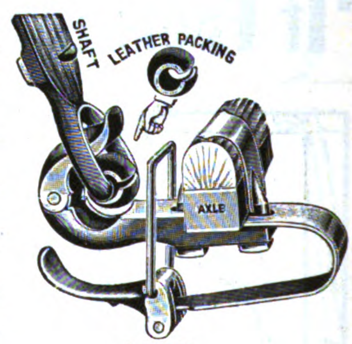
THE PARTS of this coupling cannot be lost, simply because there are no loose or separate parts. It is complete in itself.

The Bradley Shaft Coupling is made entirely of STEEL.

Beware of a Coupling that has malleable iron parts. It is not safe.

The Bradley is the only Coupling that will not rattle—see the Gap.

A Blacksmith can make a good profit by putting Bradley Couplings on old or new vehicles. They make a good carriage better.



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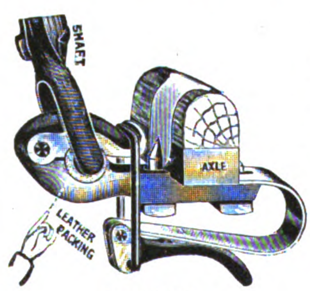


CLOSED

We make them in sizes to suit buggies, surreys, delivery and express wagons—four sizes in all—and all right, and all Steel.

Dealers in carriage materials usually handle our Couplings.

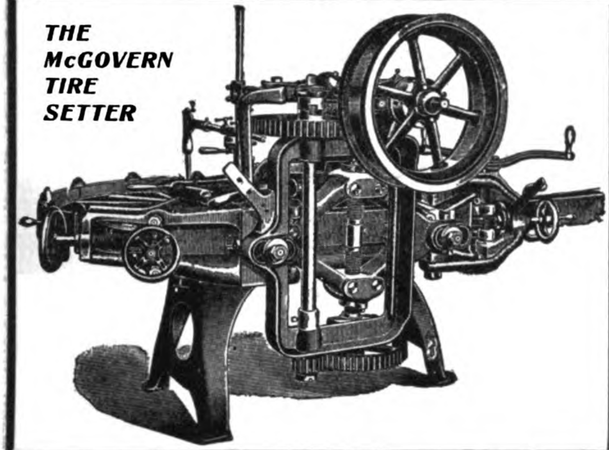
If your dealer don't, we will sell you direct.

We have printed matter describing our Couplings that you can have for the asking.

C. C. Bradley & Son,

Syracuse, N. Y.

THE McGOVERN TIRE SETTER



READ WHAT THEY SAY.

Hamilton, Tex., Nov. 4th, 1903.

THE McGOVERN TIRE SETTER Co.,
Cincinnati, Ohio.

Dear Sirs:—In regard to the McGovern Tire Setter, I think it is the very best machine a blacksmith and repair man can buy. It does much better work than can be done the old way and so much faster. It does all that is claimed for it and it helps to build up and advertise a man's business.

When I put in my machine there were six shops in town and in fifteen months there were only three left, and I own two of them. The McGovern machine knocked them out. No man can spend his money for a better or a more money-making machine.

Yours truly,
A. J. HERRINGTON.

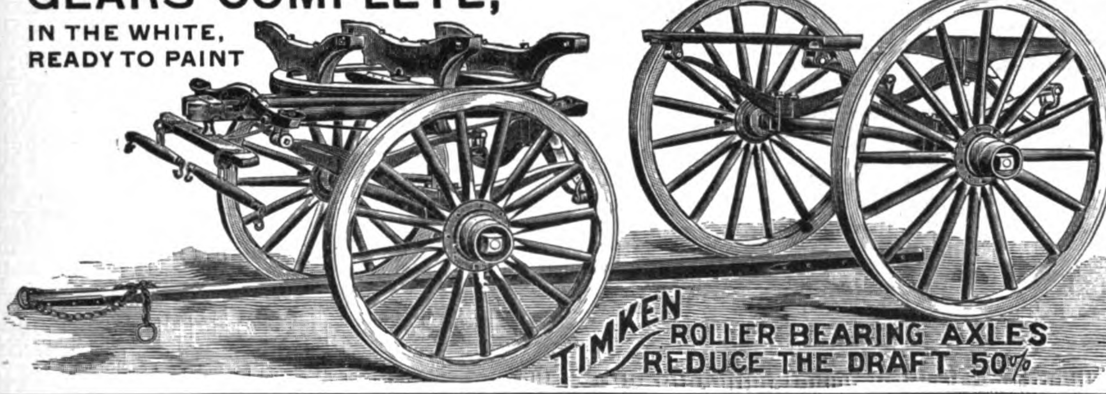
The above is a fair illustration of what can be done with the McGovern machine in any territory. Our machine is a big money-maker and is adapted for all kinds of tire setting—channel, cushion, or plain—on both old and new wheels. No crushing, driving or injury whatever in our method. Write us your requirements.

The McGovern Tire Setter Co.

Garrard and Elam Sts., CINCINNATI, OHIO.

GEARS COMPLETE,

IN THE WHITE, READY TO PAINT



FOR LIGHT AND HEAVY
Delivery Wagons
ALSO FOR
Ice, Brewery and Transfer Wagons

THE SELLE GEAR CO.,
SOUTH HIGH ST.
AKRON, OHIO.

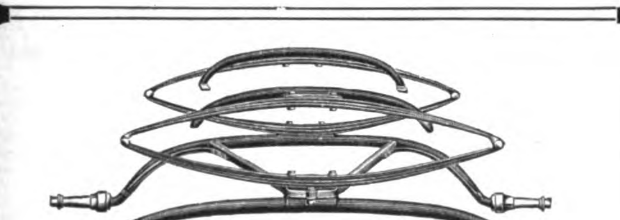
In writing for prices give full specifications and description of what is wanted, so as to enable us to make prompt quotations.

GEARS

Gears for Wood Wheels.

Gears for Wire Wheels.

Assembled Complete or Welded Axles and Wheels Ready to Assemble.



PREMIER MFG. CO.
GEAR No. 225 L. D.—C.

Let us send you a copy of our No. 15 catalog in which our full line of gears and gear sets are illustrated and listed.

The Premier Manufacturing Company

HARTFORD, CONN.

Look!

Drills
Bolt Cutters
Portable Forges
Tire Benders
Tire Shrinkers
Bolt Headers
Etc

All Boynton & Plummer drills have forged

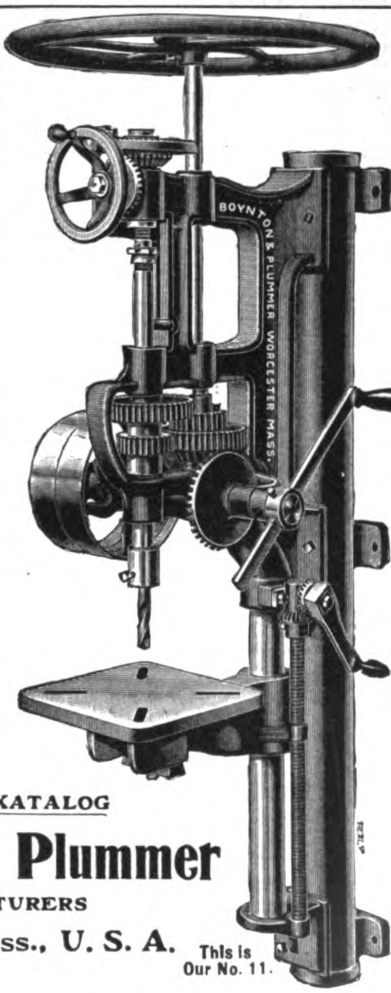
Steel Spindles

Spindle bearings bored and reamed from solid stock

Not Babbitted

Best Material
Best Workmanship
Best Anyway

SEND FOR KATALOG



Boynton & Plummer

MANUFACTURERS

Worcester, Mass., U. S. A.

This is Our No. 11.

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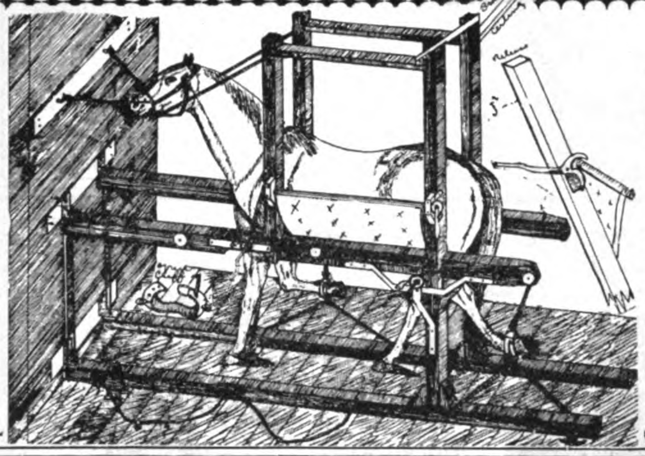
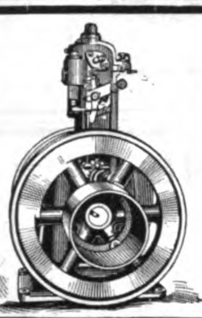
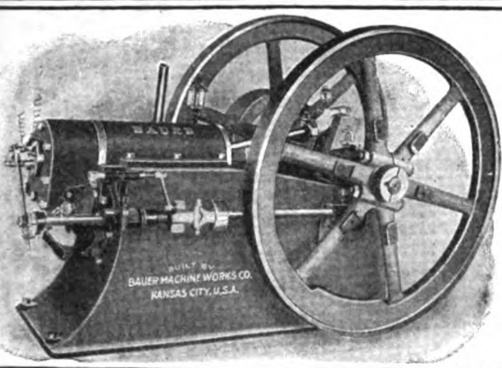
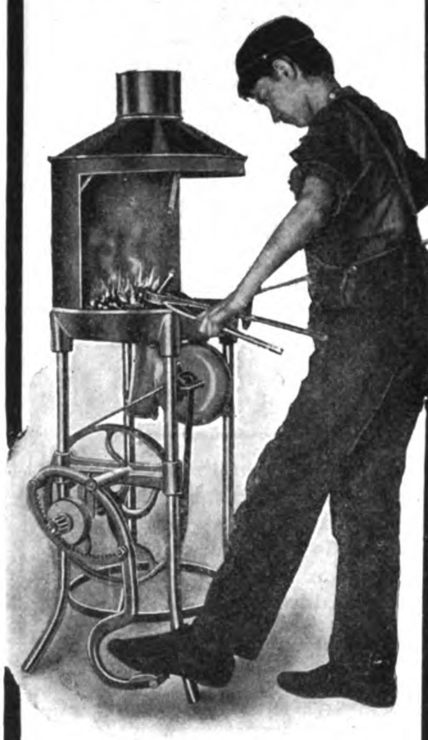





BAUER
BUILT BY BAUER MACHINE WORKS CO. KANSAS CITY, U.S.A.



Cast-Iron Breaks;

Why not Braze it

In a few minutes in your own shop?

BRAZIT. CAST IRON TRADE MARK.

Thousands of Dollars

are lost every day because of broken castings. The expense of replacing broken castings, especially if large or intricate, is immense. Much money is lost because of machines lying idle waiting for new castings. YOU CAN PREVENT THESE LARGE LOSSES BY **MENDING CASTINGS** and make a BIG PROFIT for yourself. For instance, suppose a gear wheel breaks. It may cost fifteen or twenty dollars for a new one, and the mill would have to lie idle for perhaps a week before the new one arrived. By means of a few cents' worth of BRAZIT, however, you can repair the wheel STRONGER THAN NEW and make as much money in an hour as you often make in days.

Brazit Will Do It

It will successfully braze cast iron, braze cast iron to wrought iron, or weld steel to cast iron.

NOTE.—Mr. Theodore Brightman, of South Dartmouth, Mass., says, "I have used your compound and it worked O. K. Wish I had had some of it before."

In order to introduce this money-making compound to blacksmiths we will send a sample trial set sufficient to braze a number of pieces to any address for $1.00.

We send our regular working sets, a complete outfit with plain directions for $5.00.

A trial of BRAZIT is the best way we know of for proving to you it will do as claimed. WE WANT YOU TO TRY IT. You can do a big and profitable business mending all the broken castings in your neighborhood.

WRITE US TODAY

U. S. Brazing Compound Company,

113-115 So. Second St., NEW BEDFORD, MASS.

Successors to EASTERN COMPOUND CO.

A Veterinary Specific. GUARANTEED

DEATH TO HEAVES.

Newton's Heave, Cough, Distemper and Indigestion Cure.

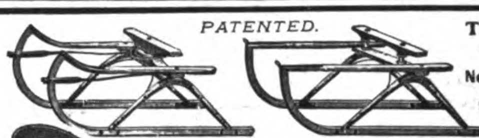
ABSOLUTELY WHAT ITS NAME IMPLIES.

It acts on the Digestive, Respirative Organs, their Nerve supply and on the Blood. Send for booklet "Horse Troubles," and **Strong Recommends** from merchants and users. 12th year's sale. **$1.00 per can** of dealers, or by mail or express, prepaid.

Newton Horse Remedy Co., Toledo, Ohio.

Success Oscillating Sleigh Knees.

PATENTED.



For farm, road and lumbering Bobs. Sizes, $1\frac{1}{2}$, $1\frac{3}{4}$, 2, $2\frac{1}{2}$, 3, x $3\frac{1}{2}$, in. runners. Satisfaction Sure. Try Sample Set.

THIS is the Brown Oscillating Sleigh Knee. **Needs No Recommendation. Satisfaction Guaranteed.**

Valley City Bent Knee Bob Sleighs.

For Pleasure, Delivery, Express, Sleigh, etc.

The Strongest, Neatest, and Best.

Sizes, $1\frac{1}{4}$, $1\frac{1}{2}$, $1\frac{3}{4}$, 2, $2\frac{1}{2}$, 3 and $3\frac{1}{2}$.

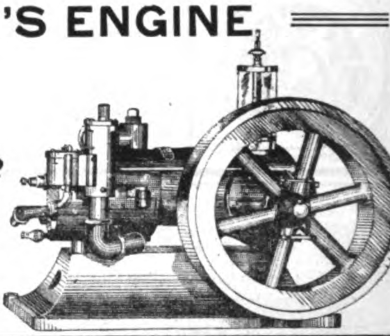
Write us.

Sherwood Hall Co., Ltd., Manufacturers - Grand Rapids, Mich.

THE BLACKSMITH'S ENGINE

New Type

Two-Cycle Gasoline Engine



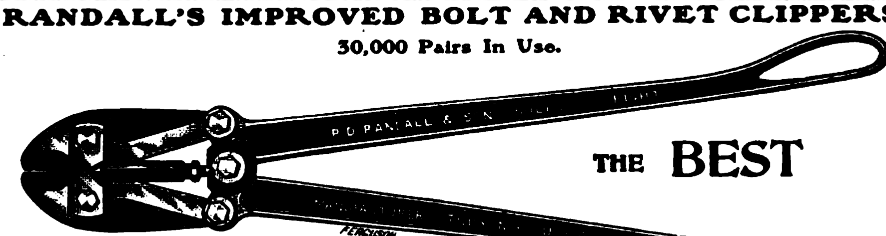
that RUNS as STEADILY, is just as SURE and makes no more noise than a STEAM ENGINE. The simplest engine made. It is dust proof. $1\frac{1}{2}$, 3 and 6 H. P. Write for catalogue and prices.

Cushman Motor Co.

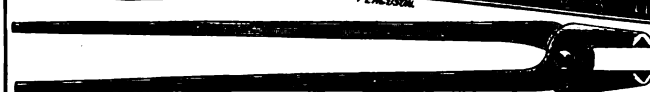
LINCOLN, NEBR.

RANDALL'S IMPROVED BOLT AND RIVET CLIPPERS

30,000 Pairs In Use.



THE BEST



V Tongs for Holding Round and Square Iron.

Blacksmith Tongs, drop forged, without weld, from one solid piece of superior steel. Common and V Tongs made all sizes, from separate dies. "Machine Tool" Horse Shoe Tongs, etc. A complete line. The best goods ever produced. 50,000 pairs in use. Apply to nearest jobber, or address,

[Mention The American Blacksmith.]

P. D. RANDALL & CO., Springfield, Mass.

DOES THE BEST WORK EASIEST KEPT IN ORDER

It is the most Powerful

Does the Largest Range of Work

SOLD BY

Bliss Manufacturing Co.

SOUTH EGREMONT, MASS.

EXPORT AGENT: J. G. ROLLINS NEW YORK AND 124 HOLBORN LONDON, E. C.

Prices Current — Blacksmith Supplies.

The following quotations are from dealers' stock, Buffalo, N. Y., Dec. 28, 1903, and are subject to change. No variations have taken place since last month's quotations.

All prices, except on the bolts, are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel.

¼ in.. round or square;	Iron, $2.80;	Steel, $2.80
⅜ in., " "	" 2.40	" 2.40
½ in., " "	" 2.20	" 2.20

Flats—Bar and Band.

¼ x 1 in.,	Iron $2.20;	Steel..............$2.20
¼ x 1½ in.,	" 2.10;	" 2.10
3-16 x 1½ in.,	" 2.30;	" 2.30

Norway and Swedish Iron.

¼ in., round or square	$4.90
⅜ in., " "	4.50
½ in., " "	4.30
¼ x 1 in	4.30
¼ x 1½ in	4.20

Horseshoe Iron.

For No. 1 shoe, ⅜ x ½ in	$3.30
For No. 2 shoe, ½ x ⅝ in	2.90
For No. 3 shoe, ⅝ x ¾ in	2.80
For No. 4 shoe, ⅝ x ⅞ in	2.80

Toe Calk Steel.

½ x ⅜ in. and larger	$3.00

Spring Steel.

	Op. Hearth	Crucible
⅝ to 1½ in. Rounds.	$3.00,	$5.00
1¼ to 6 in. by No. 4 gauge to ½ in. Flats	" 3.00,	" 5.00

Carriage Bolts. (Net Price per Hundred).

¼ x 2 in	$0.54	⅜x2½ in	$0.82
¼ x 2½ in	.58	⅜x3½ in	.96
¼ x 3 in	.62	⅜x6 in	1.31
5-16x 2 in	.65	½x4 in	1.70
5-16x 3 in	.75	½x6 in	2.10

WANTED AND FOR SALE.

Want and for sale advertisements, situations and help wanted, twenty-five cents a line. Send cash with order. No insertions of less than two lines accepted.

FOR SALE—A Standard Hub Boring Machine used one season. **W. E. GIDDINGS, Springfield, Vt.**

FOR SALE—A good paying blacksmith and woodworker's shop, including business and building, also carrying farm machinery. Room to carry wagons and buggies if desired. Am located on the main street of one of the best dairy towns of Illinois. **W. J. SHULZ, Huntley, Ill.**

WANTED.—Blacksmiths, Horseshoers and Wheelwrights to act as subscription representatives during leisure time. Big money in return for little exertion. Write us today regarding this proposition. Address, **AMERICAN BLACKSMITH COMPANY, Subscription Dept., Buffalo, N. Y.**

FOR SALE—Small profitable business—the manufacture of ice tongs, five different sizes. Business can be moved to any locality, and can be used in connection with other business. It affords an excellent opportunity for a man to establish a business of his own with only a few hundred dollars' investment. Reason for selling is age and poor health. **D. B. MORTON, Groton, N. Y.**

DON'T BUY Toy's New Treatise on Steel, unless you want to be an expert steel worker and master blacksmith. They explain forging, annealing and tempering, high speed and self-hardening steel with 75 new ideas and methods on machine and plow forging and welding; with ten recipes for making your own compounds for welding the different kinds of steel solid. Thermite welding fully explained. It welds R. R. rails in the twinkling of an eye. Also two hand colored scientific tool tempering charts, A and B, explaining all hardening and tempering to a standard in oil, water or tallow, showing true color each tool should be, and tells what it would stand. These are the same as used by Woolwich Arsenal, England.
All the above for one dollar. Samples free.
40 years a factory steel worker.
W. M. TOY, Sidney, O.

Trade Literature and Notes.

A handsome gas engine catalogue is that now issued by the Charter Gas Engine Company, of Sterling, Ill. This catalogue will be forwarded free to any address upon receipt of request.

Lasier gas and gasoline straight-line engines are the subject of catalogue No. 10 of the Lazier Gas Engine Company, of Buffalo, N. Y. These engines are designed for all stationary power purposes.

H. L. Chapman, Marcellus, Mich., is sending out a great many neat cards, illustrating his new gasoline engine of small size, which he is placing upon the market at the present time.

A neat price list of carriage axles comes to us from the Dalzell Axle Co., of South Egremont, Mass., accompanied also by a handsome folder descriptive of their Doctor's Special Axle.

Champion Tool Company, Conneaut Lake, Pa., has just issued a neat hanging card, giving weights and measurements of iron and steel for making certain weights of shoes. This card will be sent free upon request to any address and will be found to contain information of no small value.

The Motsinger Device Manufacturing Company, Pendleton, Ind. sent us several circulars illustrating their improved Anti-Sparker, which they claim does away most successfully with starting and running batteries on gas and gasoline engines. A great many testimonial letters testifying to the merits of their machine are also included.

The handsome catalogue of the Model Gas Engine Company, of Auburn, Ind., is devoted to a complete description of the design, construction and operation of their Model Engine for operating on gas, gasoline, kerosene, crude oil or distillate. Among the chief claims for the Model Engine are simplicity of design and high economy of fuel consumption. The catalogue will pay sending for by any one interested in gas engines or their application for power purposes.

A bunch of new literature comes from The Turner Brass Works, Franklin and Michigan streets, Chicago, Ill. A red folder listing their torches, a brand new one in green containing interesting information concerning the New Turner Carburettor and foot-treadle, and a neat booklet describing their kick plates and brass specialties are among the lot. Two other small leaflets complete the collection which will be found very interesting and useful reading.

Lennox Machine Company, Marshalltown, Iowa, write us that one particular feature of their engine is that the electric ignitor can be cleaned while the engine is running; that they put a friction clutch on all of their engines, with the lever on the inside of the balance wheel where it cannot possibly be caught in the belt; that the total repairs of the Lennox engine for 1902 did not exceed over one-fifth of a cent per month for each engine. They also state that at present they are working overtime to fill orders for engines furnaces, rotary beveling and splitting shears, tapping machines and hot-air, all-steel furnaces.

Special attention is directed to the advertisement of Cray Brothers, of Cleveland, Ohio, on page 52, the outside rear cover of this issue. The advertisement is very interesting for two reasons. In the first place a very unique offer is made to blacksmiths and wagon builders. To anyone not already a subscriber to The American Blacksmith, they offer to present a year's subscription to the paper free, in return for their name, cut from the advertisement in question and accompanied with an order amounting to $5.00 or more. Those who take advantage of this offer before February 20, receive a handsome calendar free, also. The prices given in the special offers of this advertisement are unusually inviting. Cray Brothers assure us that because of doing all of their soliciting by mail without the expense of men on the road, they are able to make bed rock prices on their goods. Immediate shipments is one of the features of this firm's business. Their latest net price list of everything for the blacksmith and wagon-maker will be cheerfully mailed free on request to anyone in the trade.

The Welding Compound Company, of Paterson, N. J., are announcing to the trade that the sales of their Cherry Heat Compound for the year 1903 were the largest in the history of their business.

The Buffalo Electrotype & Engraving Company, of Buffalo, N. Y., are distributing a handsome portfolio showing proof of various specimens of their work—color process, half tone engraving, wood cuts, pen and ink sketches and electrotyping.

The York Specialty Company, York, Pa., are marketing a neat trace lock for which they claim simplicity and rapidity of operation, and perfect locking. Circulars describing the Crown Trace Lock can be had upon application to the makers, as above. There are no springs or complicated parts to get out of order, and they are adjusted with ease.

A fully and handsomely illustrated catalogue is that of the Chicago Flexible Shaft Co., of 186 Ontario St., Chicago, Ill., just received, relating to horse clipping and grooming machines and carriage heaters. This catalogue illustrates and describes a large variety of such machines as manufactured by the Chicago Flexible Shaft Company. The Clark Carriage Heater is particularly interesting at this time of the year when the mercury is flirting with the zero mark. Catalogue may be had free upon request to the above company.

The West Tire Setter Co., of Rochester, N. Y., state they recently shipped a special machine to the Johnston Harvester Co., of Batavia, N. Y., to be used for rounding up their tires and rims for metal wheels, the dies in this machine having grooves cut in the face of the same to receive the heads of spokes which project through the rims of these wheels. They have also just shipped to the Kilbourne & Jacobs Mfg. Company, of Columbus, Ohio, another special machine for setting tires on wheels, 16 inches diameter up to 24 inches. Some of the wheels on which this machine is to work are all metal, and others are wood with iron tire. It is seldom, they say, that they have a call for a machine to work on such small diameters, and American Blacksmith readers might be interested to know that they make such a machine.

This company have recently changed their office location to 509 Ellwanger & Barry Building, Rochester, N. Y.

New Books.

A systematic treatise on "How to Frame a House," is one of the four new books by Owen B. Maginnis. It gives valuable information upon this subject, with illustrations of all the different processes involved. Price, $1.00.

Another book of interest to the building blacksmith, is "Roof Framing Made Easy," by O. B. Maginnis. Like the other works of Mr. Maginnis, this is clearly worked out and profusely illustrated. Price $1.00.

The very important topic of steel hardening and tempering is ably discussed by F. Reiser, in his book, "The Hardening and Tempering of Steel," just published by Scott, Greenwood & Co. Van Nostrand Co. have American rights. The work is translated from the original German by A. Morris and H. Robson, B. S. The various processes of treating different tools and pieces are separately taken up,—an excellent book of reference. Price, $2.50.

"Modern Machine Shop Tools," their construction, operation and manipulation, including both hand and machine tools. This is the heading of the new book by William H. Van Dervort, M. E. It is a large book of 544 pages, well printed and containing 673 engravings of tools and methods. How to make and how to use the ordinary shop tools, and many interesting facts concerning them are recorded in a bright, interesting way. The book makes a very valuable addition to the library of any blacksmith or machinist.

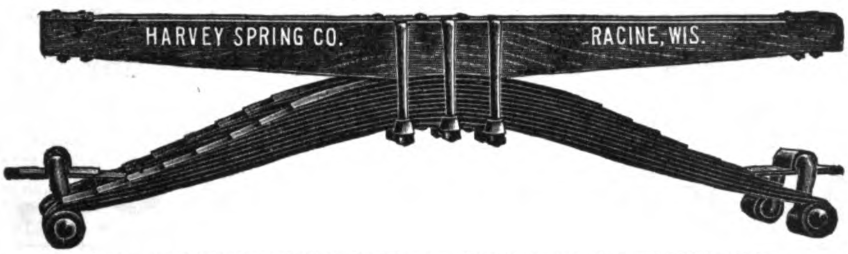
It may be had on approval from The American Blacksmith, P. O. Drawer 974, Buffalo, N. Y. Write for the book, and if you like it send $4.00 and it is yours; if not, return it.

Any of the foregoing mentioned books can be had of The American Blacksmith, P. O. Box 974, Buffalo, N. Y., on receipt of price.

HONEST DEALINGS. Before an advertisement is accepted for this journal, careful inquiry is made concerning the standing of the house signing it. Our readers are our friends and their interests will be protected. As a constant example of our good faith in AMERICAN BLACKSMITH advertisers, we will make good to subscribers loss sustained from any who prove to be deliberate swindlers. We must be notified within a month of the transaction giving rise to complaint. This does not mean that we will concern ourselves with the settlement of petty misunderstandings between subscribers and advertisers, nor will we be responsible for losses of honorable bankrupts.

MADE IN RACINE, WISCONSIN. KNOWN EVERYWHERE

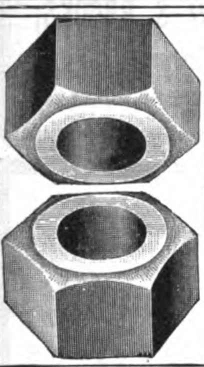
Our Famous XXX Bolster Springs



ABSOLUTELY RELIABLE, ACCEPT NO OTHERS

These Springs change a farm wagon into a spring vehicle at a small expense and you cannot afford to do without them. They save team, harness, wagon and load, besides adding to your personal comfort. We carry all sizes from 1,000 to 10,000 lbs., ribbed or plain. Ask your dealer to get them for you, or write us.

HARVEY SPRING COMPANY RACINE WISCONSIN



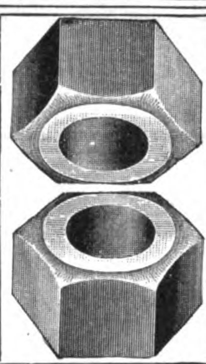
COLD PUNCHED

CHAMFERED AND TRIMMED — SEMI-FINISHED AND CASE HARDENED

NUTS

MADE OF DOUBLE REFINED BAR IRON TRUE TO SIZE AND WELL FINISHED

THE MILTON MFG. CO.
MILTON, PA.



"R. Mushet's Special Steel"

The Original Air-Hardening Steel

and STILL UNAPPROACHABLE in general excellence.

Thirty Years' Experience in Engineering Works in all parts of the World has proved Beyond all Doubt that this Steel is in every respect

THE BEST TOOL STEEL

YET MANUFACTURED

Uniformity of Quality in Every Bar. A Great Saving in Steel, Time and Wages, and Easy to Work. There are no difficulties to contend with in forging R. Mushet's Special Steel into tools and no loss in reheating. The best all-round Steel.

R. Mushet's HIGH-SPEED Steel.

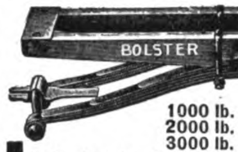
If a fast-cutting steel is required, this is the best and most reliable of this grade. It will do more work than any other known steel, and every bar is uniform and free of the "Cracking" so generally a feature in steels of this grade.

The "R. Mushet's" Steels are manufactured only by **SAMUEL OSBORN & CO,** Clyde Steel & Iron Works. Sheffield, England.

Sole Representatives in the United States, Canada and Mexico:

B. M. JONES & CO.

159 Devonshire St., BOSTON. 143 Liberty St., NEW YORK.



SPRINGS AT Half Price.

1000 lb. capacity	-	$2.75
2000 lb.	Other sizes in	3.25
3000 lb.	proportion.	4.00

Coil and crank springs of all kinds. Send for free illustrated catalogue and prices on full line.

Racine Pole and Spring Co., Box 35, Racine, Wis.

IF YOUR NEWSDEALER

Or the News stand nearest you does not have THE AMERICAN BLACKSMITH, he will get it for you every month if you ask him, and each copy will cost you only 10 cts.

AN INVESTIGATION

Will Prove the Merits of Our

Paints, Colors Varnish

They are Money in Pocket . . .

Buckeye Paint and Varnish Co.
TOLEDO, OHIO

Carriage and Wagon Colors and Varnishes a Specialty

"The Australasian Coachbuilder & Wheelwright."

A Monthly Illustrated Technical Journal circulating amongst Coachbuilders, Wheelwrights and Blacksmiths throughout the Commonwealth of Australia, New Zealand and South Africa.

Advertising and subscription rates on application to

J. E. BISHOP & CO.,
65 MARKET STREET,
Sydney, Australia.

THE ALTON'S 1904 COW BOY GIRL

TRADE-MARK.

"Sequel to the Fencing Girl."

Copyright, 1903, by Chicago & Alton Railway.

ART CALENDAR

Four graceful poses from life; figures ten inches high, reproduced in colors. Highest example of lithographic art.

"THE ONLY WAY"

to own one of these beautiful calendars is to send twenty-five cents with name of publication in which you read this advertisement, to GEO. J. CHARLTON, Gen'l Passenger Agent, Chicago & Alton Railway, CHICAGO, ILL.

The best railway line between CHICAGO, ST. LOUIS, KANSAS CITY and PEORIA. Take the "Alton" to the St. Louis World's Fair, 1904.

Bicknell's No. 77 Bench Punch.

In use from the Atlantic to the Pacific. Endorsed by all workers of metal. We make different styles and sizes of hand and power punches and shears, also new 1904 power hammer, jointers, pole rounders and other tools. • WRITE FOR PRICES.

THE BICKNELL HARDWARE CO.
Janesville, Wis.

An Excellent Book FOR THE PRACTICAL CRAFTSMAN

Modern Blacksmithing, Rational Horseshoeing and Wagon Making
BY J. G. HOLSTROM

With rules, tables, and recipes useful to blacksmiths, wagon makers, horseshoers, farmers, well drillers and machinists. An excellent reference book which will prove of daily aid to the practical man. Fully Illustrated—Cloth Bound—Large Type. **PRICE, $1.00.**

American Blacksmith Company,* Drawer 974, *Buffalo, N. Y.

HERCULES "HOT BLAST" BLOW TORCH.

Simple.
Easily Controlled
Maximum Heat-Ing Power
Unequalled for Brazing Tire Wires, Etc.

Height 10 Inches; Weight 4 lbs.; Capacity, 1 qt.; Consumes ½ pint per hour.

HERCULES

OUR NEW BURNER enables the operator by one Needle Valve only, to obtain a large steady blue flame of about 2500 degrees F., sufficient to braze 3-8x1-16 steel bands, or 5-16 steel wire. Two turns of needle handle reduces flame to needle point of same heating power, This cannot be obtained from any other single needle valve burner. Invaluable to all mechanics, electricians, manufacturers of and repairers of rubber tires, etc. All parts interchangeable.

Price $3.60 Each.

WHITE MANUFACTURING CO.,
CHICAGO, ILL.

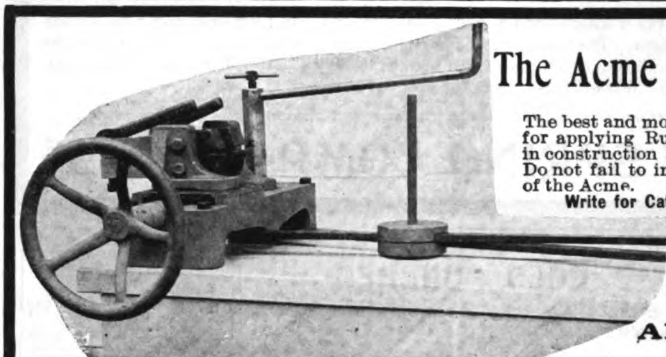
CARRIAGE "The Best"
and WAGON

AXLES

Every Kind, Style and Pattern. Order any Quantity, or Send for Price List, Etc. . . .

Wood, Smith & Co.,

CHICAGO HEIGHTS, ILLS.



The Acme Tire Machine

The best and most practical machine for applying Rubber Tires. Simple in construction and easy to operate. Do not fail to investigate the merits of the Acme.
Write for Catalogue and Prices.

W. S. BROOKS,
44 AMES COURT,
AKRON, OHIO.

Little Giant
Punch and Shear.

Most Powerful Lever Punch and Shear Made.

100 lbs. on lever gives 25,000 lbs. pressure on punch. Always ready for work, and it does the business. Made in three sizes. No. 1 cuts iron ⅝ thick up to 8 inches wide and 1 inch round; it will punch ⅝ hole in ½-inch iron. Weight, 500 lbs. No. 2 cuts iron 6x½ and ⅞ round, punches ⅝-inch hole in ½-inch iron. Weight, 350 lbs. No. 3 cuts iron 6x⅜, punches ½-inch hole in ⅜-inch iron. Weight, 250 lbs. Occupies a floor space when lever is up, 10x24 inches. It is simple in construction, there being only two pieces of casting in it. You can duplicate any part of it in your own blacksmith shop. We furnish with each machine five sets of punches and dies, any size, from 3-16 to ⅝. There are two lower shears, one for round and one for flat iron. You will find use for it every day. Let us send you full descriptions and a list of testimonials from satisfied users.

Manufactured by C. CROTHERS, Kansas City, Kan.
For Sale by Hardware Dealers. *Send for Circular.*

THE SCREW is the most powerful appliance known to mechanics. The HENDERSON TIRE SETTER has sixteen powerful screws surrounding the entire wheel. The screws are always in place and pressure can be put on where needed to set the tire and tighten all parts of a wheel.

OVER 800 MACHINES IN USE PROVE THEIR EFFICIENCY

TIRE SETTER SHOULD BE USED ON A ROUND WHEEL A ROUND

Standard Tire Setter Co.
KEOKUK, IOWA

We Want
Every Blacksmith

To just have a look at the American Steel Worker by E. R. Markham. We don't ask him to dig down in his pocket for something he isn't sure of—don't ask him to take our word for it—don't want his money until he has the book in his hands long enough to know its worth,—two fifty to him.

We want you to know how much practical information is stowed away in the 343 pages that make up this book. How it points out practical methods of hardening that you can adapt in your own shop and do away with the uncertainty and the "luck." Assures success every time if you do as Markham points out. He isn't a budding genius, but has been hardening steel these 27 years and knows what's what.

If you'd rather send the $2.50 in advance, just remember it's yours if the book doesn't suit. We send any mechanical book costing a dollar or more, on approval anywhere in North America. Better write today.

THE DERRY-COLLARD CO.

256 G, Broadway, NEW YORK.

A Special $25.00 Prize goes to the person sending in the largest club of new subscribers before April. Prize equally divided if two or more send in the same number. Whether you win the prize or not, you receive a premium or cash commission. Can you form a club among your brother craftsmen? Write for list of premiums and commissions.

AMERICAN BLACKSMITH COMPANY, P. O. Box 974, BUFFALO, N. Y.

EASY PROFITS

Follow an explanation of the many advantages of our

IMPROVED FOLDING WAGON BOX

Simple, durable, convenient, strong, easily knocked down, compactly stored.

Any Farmer or Wagon User is quick to appreciate the time, labor and storage-space saving qualities of the folding farm wagon box.

ANY BLACKSMITH or wagon builder can easily, quickly and cheaply build the Folding Box right in his own shop, **by using our Irons**, and can secure all the wagon trade in his neighborhood with quick and **EASY PROFITS**.

Write at once for descriptive circular of our Irons, with directions for building Folding Wagon Boxes.

FOLDING WAGON BOX CO., HAVERHILL, OHIO.

DIRECT FROM MANUFACTURER TO YOU, BLACKSMITHS.

$170.00 puts one of our 6 H. P. break-test horizontal gas or gasoline engines in your town or city. All complete with batteries, wire and switch, water tank and connections, gasoline tank and connections, exhaust pipe, wrenches and oil can. This means we pay freight and run risk in shipment. If not satisfied after sixty days trial, your money refunded.

DURABILITY. We claim that the Underwood Engines are unequalled in durability for the following reason: The engines are built from materials of the best quality and in accordance with the highest standards of machine practice.

SIMPLICITY. All mechanics are aware that in the construction of any machine it is extremely desirable to reduce the number of parts and pieces to the smallest possible quantity, and that the more simple a machine is the less liable it is to get out of order, and the more easy it is to repair should it get out of order. These advantages will be found with the Underwood Engine.

Its simplicity obviates the necessity of skilled attendance. A boy can learn in a few hours so that he can give it all the attention it requires.

GUARANTEE. We guarantee all our engines to be of the very best material and workmanship and agree to replace any defective part f. o. b. our own works without cost, for two years. Engines built in sizes of 2, 4, 6, 10, 12 and 15 H. P., break-test or actual.

Send for Catalog. **The Underwood Gas Engine & Motor Co.,** ELMORE, OHIO.

We Will Make You Bottom Prices and Terms

ON STOCK IN OUR LINE, INCLUDING

Barcus Shoeing Stocks, Brooks Tire Machines, Canedy-Otto Mf'g Co'y make of Tools, Star, North-Western, Lone Star, Standard, New Haven, Putnam, Capewell Horse Nails; Perkins, Burden, Old Dominion, Excelsior, Phoenix, Eagle Horse Shoes; CI-CO Fire-Pots; Hawkeye, Boss and Little Giant Power Hammers; Sweet's Rubber Tire and Machines; Weber Gasoline Engines; Hay-Budden and Trenton Anvils, Dalzell Axle Company's Axles, New Etna Coal Company's Blacksmith Coal; Selle Gear Company's Line of Gears; Ideal, Star and Our Special Plow Shares, etc., etc.

CAMPBELL IRON COMPANY,

Heavy Hardware and Iron. - St. Louis, Missouri.

Expert Horseshoers Demand the

Vulcan Horse Nail

Because

It is made from the BEST MATERIAL produced in SWEDEN and always to be depended upon for QUALITY and UNIFORMITY.

Send us a trial order and be convinced

THE FOWLER NAIL COMPANY, Sole Manufacturers, SEYMOUR, CONN.

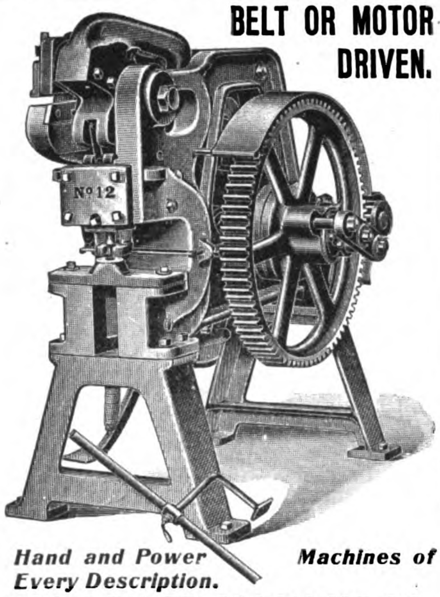
WOOD'S "UNIVERSAL" HOLLOW AUGER

Cuts ¼-in. to 1¼-in.
EVERY PART STEEL.

Instantly adjustable; absolutely accurate; the leading Hollow Auger on the market.
YOUR SUPPLY DEALER has it; if not, kindly write us—the sole manufacturers—and your inquiry will receive instant attention.

THE A. A. WOOD & SONS COMPANY,
2 GARNETT ST., ATLANTA, GEORGIA.

BADGER PUNCHES AND SHEARS. BELT OR MOTOR DRIVEN.

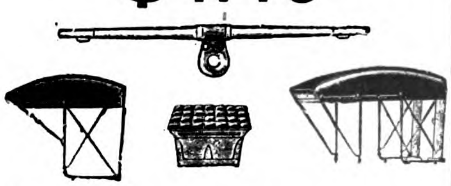


Hand and Power Machines of Every Description.

ROCK RIVER MACHINE CO.
Janesville, Wis., U. S. A.

THINK OF IT

A LINED BUGGY TOP FOR
$4.40



We also manufacture a complete line of higher priced buggy tops, cushions, dashes, storm aprons, etc.

Write for our 1904 Catalogue.

BAUER BROS. MFG. CO.
937 to 943 W. 8th St.
CINCINNATI, OHIO.

CLYDESDALE OINTMENT

KING OF HEALERS.
NO OTHER OINTMENT OR SALVE AS GOOD,
Cures Foot trouble or any Sore. Sold in 25c and 50c boxes, and in 10 lb. pails for packing under pads.

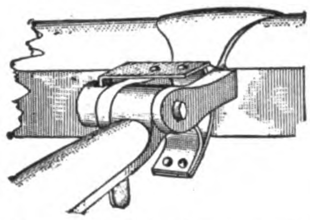
GEO. W. BICKNELL CO.
PITTSBURG, PA.

30 CENTS

Sent to the Speedy Shaft Coupler Co., Cedar Rapids, Iowa, will bring you a sample pair of their

"Speedy Shaft Couplers."

Stops the Rattle.
Changes Pole to Shaft in 60 Seconds.



Every Coupler Guaranteed.

We make the above special offer in order to introduce our couplings to the trade.
Will be pleased to quote prices on larger lots to the trade. When ordering state size, ⅜ or $\frac{7}{16}$.
Write today for sample pair.

THE SPEEDY SHAFT COUPLER CO.,
CEDAR RAPIDS, IOWA.

LOOK at this!

The Elsey corner irons and seat posts for buggy bodies take the place of the wood posts, and make a body that will never pull apart. Quicker to put on than wood posts.

GRANT E. ELSEY & CO.
AURORA, MO.

Leather Aprons

For the Jobbing Trade.

Samples of Leather and prices on application

The Hull Bros. Co.
Danbury, Conn.

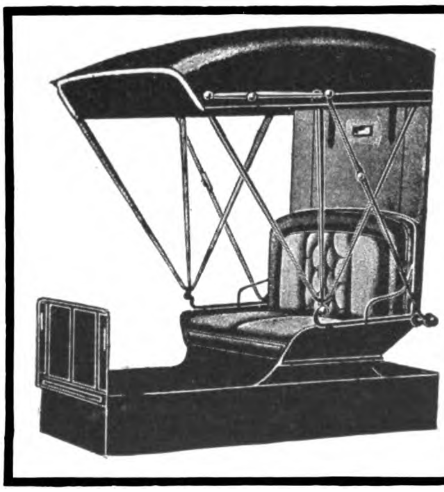
HENDRY'S ANTI RATTLER THILL COUPLING SPRING

IS UNQUESTIONABLY THE BEST METAL SPRING MADE for the purpose; it is adapted to any Coupling; is so formed not to wear it, yet HOLDS the shaft PERFECTLY in place and PREVENTS all rattling.

Being an oil tempered steel spring it has LASTING qualities; is EASILY adjusted. Six sizes, ¾, ⅞, 1, 1⅛, 1¼, 1½ inches.

MADE BY
SABIN MACHINE CO.
MONTPELIER, VT.

OF COURSE YOU KNOW



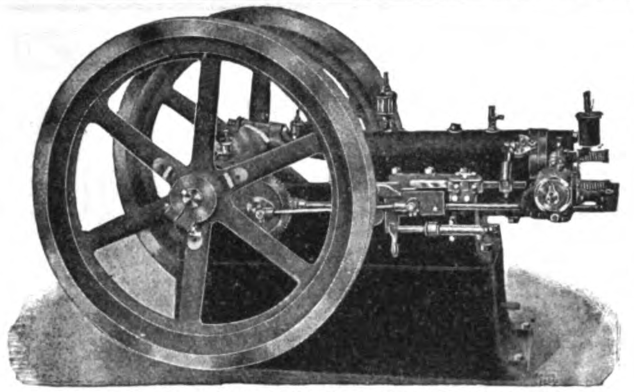
WE MAKE

Buggy Bodies, trimmed complete—all patterns—all prices.

Buggy Seats with Tops, Cushions and Backs—all grades.

Also Tops, Cushions and Backs separate. WRITE US FOR PRICES.

The Initial Toe Pad Co.,
Three Rivers, Mich.



TO MAKE MONEY
BUY A GEMMER

Man power is costly. It is poor economy to try to do work that you can make an engine do. The Gemmer Engine will more than pay for itself the first year it is in your shop. Our 2½ H. P. has been brought out especially to meet the requirements of the blacksmith and for similar work. It develops four actual H. P.

THE GEMMER COSTS LESS TO RUN

than any other engine made, using less than 1-12 of a gallon of gasoline per H. P. per hour. Its superior economy has been repeatedly demonstrated in competitive tests.

The UNUSUAL SIMPLICITY, HIGH-CLASS CONSTRUCTION AND LOW PRICES are other features that are making the Gemmer a popular machine wherever power is needed. Every engine sold makes us new friends.

To prove the truth of our claims, we will ship any size engine and allow you

Free Trial at Your Own Work.

If not as represented and first-class in every respect it may be returned at our expense. **WRITE FOR CATALOGUE.**

GEMMER ENGINE & MFG. CO.,
1730 Park Street, - - MARION, IND.

TOOL GRINDER

FREE TRIAL.

Use it 10 days.

PRICE

$9.00

IF YOU KEEP IT.

Return it at our expense if not satisfied.

SUCCESS TOOL GRINDER

Grinds, sharpens and polishes all tools. Fitted with World's Famous Carborundum Wheels. Grinds twenty times as fast as Sandstone, eight times as efficient as emery. Beautiful Carborundum crystal and booklet free.

LUTHER BROS. CO.
No. 1 Villard Ave., - NO. MILWAUKEE, WIS.

There is a demand, far in excess of the supply, for men of special ability. It is equally true that there is a supply, far in excess of the demand, for men of average ability. He that belongs to the latter class can never hope to command a larger salary than any of his fellows. His employer is independent of his services, because his place can be filled at an hour's notice, from the army of average men always looking for work.

On the other hand, fine positions are seeking the man of special ability that can do one thing well—better than any other fellow.

The business of the Schools is to convert average men into men of special ability.

Let us make you a specialist—lift you from low wages to a high salary.

Cut out, fill in, and mail the coupon.

Do It Now

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 1302, Scranton, Pa.

Please send me a free copy of "1001 Stories of Success," and explain how I can qualify for position before which I have marked **X**.

Civil Engineer	Marine Engineer
Bridge Engineer	Surveyor
Mechanical Engineer	Mining Engineer
Mechanical Draftsman	Mine Superintendent
Machine Designer	Mine Foreman
Electrical Engineer	Architect
Municipal Engineer	Bookkeeper
Air-Brake Inspector	Stenographer
Chemist	Show-Card Writer
Sheet-Metal Draftsman	Ad Writer
Sanitary Engineer	To Speak French
Electrician	To Speak German
Steam Engineer	To Speak Spanish

Name ____________ *Age* ______

St. & No. ____________

City ____________ *State* ______

AT FACTORY PRICES

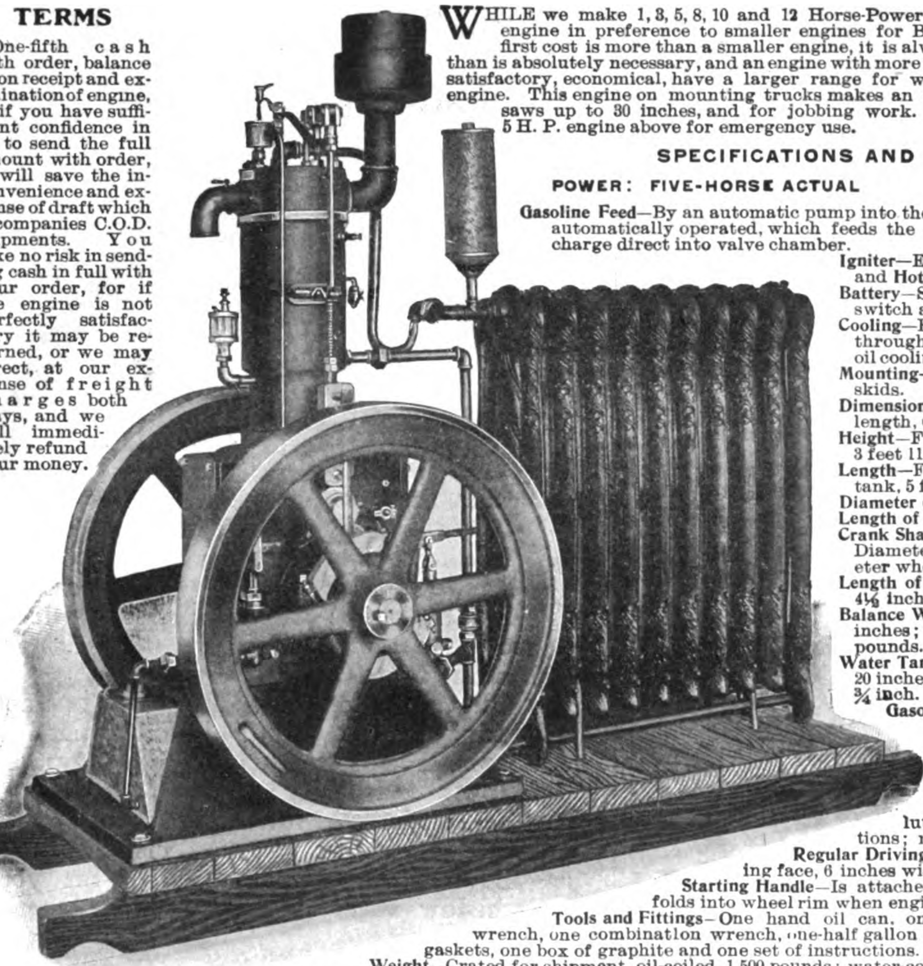
RELIANCE Five-Horse Power Stationary Gasoline Engine

The Most Modern and Simple in Design
The Best Material, Construction and Finish
The Most Economical Gasoline Engine Ever Made

FROST-PROOF

TERMS

One-fifth cash with order, balance upon receipt and examination of engine, or if you have sufficient confidence in us to send the full amount with order, it will save the inconvenience and expense of draft which accompanies C.O.D. shipments. You take no risk in sending cash in full with your order, for if the engine is not perfectly satisfactory it may be returned, or we may direct, at our expense of freight charges both ways, and we will immediately refund your money.



WHILE we make 1, 3, 5, 8, 10 and 12 Horse-Power, we recommend this 5 H. P. size of engine in preference to smaller engines for Blacksmith shops, because, while its first cost is more than a smaller engine, it is always best to have a little more power than is absolutely necessary, and an engine with more than sufficient power will prove more satisfactory, economical, have a larger range for work and last longer than a smaller engine. This engine on mounting trucks makes an excellent rig for wood sawing, with saws up to 30 inches, and for jobbing work. We furnish the Hot Tube with the 5 H. P. engine above for emergency use.

SPECIFICATIONS AND DIMENSIONS:

POWER: FIVE-HORSE ACTUAL **TYPE: FOUR CYCLE**

Gasoline Feed—By an automatic pump into the reservoir, then by a sight feed valve automatically operated, which feeds the correct amount of gasoline for each charge direct into valve chamber.

Igniter—Electric jump spark all wired to engine and Hot tube.

Battery—Six dry cells with jump spark coil, switch and connecting wires.

Cooling—By water circulating from tank, through water jacket and back to tank, or by oil cooling system as illustrated.

Mounting—Self contained on platform and skids.

Dimensions Over All—Height, 4 feet 10 inches; length, 6 feet 1 inch; width, 2 feet 11 inches.

Height—From bottom of base to top of cylinder, 3 feet 11 inches.

Length—From front of engine to back of water tank, 5 feet 5 inches.

Diameter of Cylinder—5 inches.

Length of Stroke—7½ inches.

Crank Shaft—Forged steel, finished all over. Diameter in main bearings, 1⅞ inches; diameter where pulley fits, 1¾ inches.

Length of Nickel-Bronze Split Main Bearings—4½ inches.

Balance Wheels—Number, 2; diameter, 28 inches; face, 3 inches; weight, each, 180 pounds.

Water Tank—Height, 4 feet 10 inches; diameter, 20 inches; capacity, 80 gallons; connections, ¾ inch.

Gasoline Tank—Capacity, 6 gallons; connections, ¼-inch.

Muffler—Complete with connections to engine; connections, 2 inches.

Revolutions of Driving Pulley per Minute—Regular speed, 375 revolutions; minimum speed, 200 revolutions; maximum speed, 500 revolutions.

Regular Driving Pulley—Diameter, 10 inches; crowning face, 6 inches wide.

Starting Handle—Is attached to right hand balance wheel and folds into wheel rim when engine is running.

Tools and Fittings—One hand oil can, one screened funnel, one double end wrench, one combination wrench, one-half gallon can of engine oil, two cylinder head gaskets, one box of graphite and one set of instructions.

Weight—Crated for shipment, oil-coiled, 1,500 pounds; water-cooled, 1,200 pounds.

Shipment—Direct from factory in Milwaukee, Wisconsin, on receipt of order.

Specials—We can furnish this engine with either oil cooling device or water cooling tank and fixtures, at the prices shown below. We can also furnish mounting trucks, suitable for this engine, at price shown below. Will furnish either a 12x6-inch or a 14x6-inch driving pulley in place of the regular pulley, without extra charge, if so ordered. Specials and mounting trucks may cause a delay of from one to three weeks in shipment, except there will be no delay on account of change in size of pulley.

Note—A 5-inch belt on a 10-inch pulley will transmit 6½-horse power at regular speed of engine, or over one-half horse power more than should be expected of the engine.

SPECIAL NET PRICES.

No. G-10—Five-H. P. Stationary Gasoline Engine, as per specifications, water cooling, with Jump Spark Electric Igniter, Battery and Hot Tube $175.50
No. G-11—Five-H. P. Stationary Gasoline Engine, oil cooling, with Jump Spark Electric Igniter, Battery and Hot Tube 209.50
No. G-12—Mounting Trucks for Five-Horse Power Engine, including mounting engine, approximate weight 650 pounds 52 50

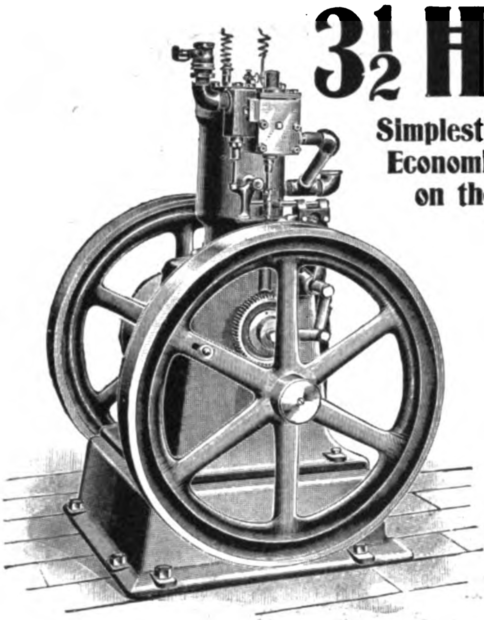
We sell direct to Blacksmiths at Factory Prices. We want every Blacksmith that buys the Reliance to take the agency for his town or locality. He can soon pay for his own engine out of his profits on sales to others.

We give the above complete detailed description in order to enable the blacksmith that needs an engine to send in his order without first having to write for specifications and prices. We can say nothing more in regard to the above engine that the above description does not give. It is positively the best engine in every way on the market today.

RELIANCE GAS & OIL ENGINE COMPANY

MILWAUKEE, WISCONSIN

Expressly Designed for Blacksmiths



3½ H. P.

Simplest and Most Economical Engine on the Market

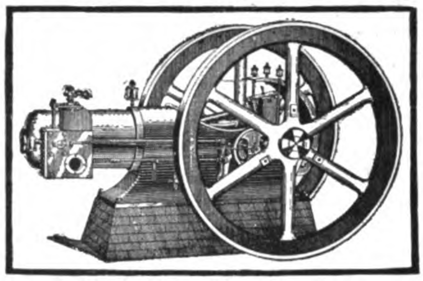
Gas or Gasoline. Electric or Tube Ignition. Other Sizes 5, 8 and 10 Horsepower Horizontal.

Write for Prices

WILLIAMSPORT GAS ENGINE CO.,
Williamsport, Pa.

IN A CLASS BY ITSELF

The Model Gas Engine

SIMPLICITY  ECONOMY

There are no simpler engines built. They are designed with the greatest care, anyone can run them, never get out of order. Model engines will cost you nothing for repairs.

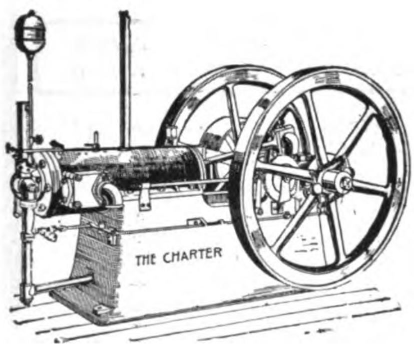
Small fuel consumption is one of the fine points of the **MODEL.** See guarantee. You only pay for an engine once, but fuel you are buying all the time. A cheap "scrap-iron" engine will cost you the most in the end.

Don't take our Word when we claim there is no better engine on the market, but read in our catalogue the strongest and broadest guarantee covering any engine. Also let us send a host of testimonials from parties who would use no other engine. **HERE** is a small part of the big guarantee, with which we back our claims as to perfect material, construction and operation:

We Guarantee a fuel consumption not to exceed ¾ gallon of 74-degree gasoline per horse power in ten hours. We guarantee Model Engines to start easily, run smoothly, require no attention and to be perfectly safe. **You Run No Risk When You Get a MODEL.** Write for our interesting catalogue, free.

Model Gas Engine Co.
AUBURN, INDIANA.

Have You A Gasoline Engine ?



OR HAVE YOU SEEN ONE THAT CAUSES ALL KINDS OF ANNOYANCE IN STARTING, NEEDS CONSTANT ATTENTION, USES TOO MUCH GASOLINE, WEARS OUT LONG BEFORE IT HAS GROWN OLD, SUBJECTS THE USER TO CONSTANT DANGER OF FIRE AND EXPLOSION

?

THE CHARTER

Is not a cheap gasoline engine unless its avoidance of all of the above objectionable features is taken into consideration.

Many "Charters" are in use and giving good satisfaction, that were built years before any and all other gasoline engines in the world.

CATALOGUE AND TESTIMONIALS ON APPLICATION.

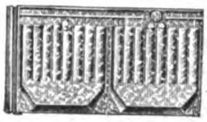
State Your Power Needs.

Charter Gas Engine Co. **BOX 324** **STERLING, ILL.**

DON'T buy a gas or gasoline engine until you receive our catalogue and prices. For the next sixty days we will sell a $3\frac{1}{2}$ engine for $100 spot cash. We manufacture 20 different sizes.

LAZIER GAS ENGINE CO., BUFFALO, N. Y.

METAL SHINGLE ROOFING...



With Montross Telescope Side-Lock is the best roofing in the world for house or barn. ☞ Storm proof. Easily applied. Catalogue, Prices and Testimonials free for the asking.

Montross Metal Shingle Co., Camden, N. J.

FREE TRIAL of the BEERY BIT

FOUR BITS IN ONE

Cures Kickers, Runaways, Pullers, Shyers, etc. Send for Bit on **Ten Days Trial** and circular showing the four distinct ways of using it.

Prof. C C Beery, Pleasant Hill, Ohio

Apple Water, Dirt, Dust and Oil Proof.

Will Pay for itself by saving Renewals of Batteries.

Automatic Gas Completely Enclosed **Engine Igniter.**

Dynamo with bevel Friction Governor.

WRITE FOR CATALOGUE.

The DAYTON ELECTRICAL M'F'G CO., 8 Jefferson St., Dayton, O.

THE MIETZ & WEISS (constant trust)

Gas and KEROSENE Engine.

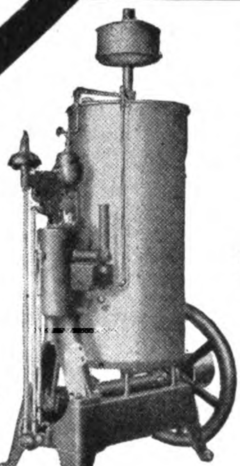
Highest Award for Direct-Coupled Engine and Generator, Paris Exposition, 1900.

Gold Medal, Pan-American Exposition, 1901.

Gold Medal, Charleston, S. C., Exposition 1902.

For Pumping, Electric Lighting and all Power Purposes, Portable Outfits, Hoisting Engines. Safe, Simple, Economical, Automatic, Close Regulation, Direct-Coupled or Belt to Generator, 1 to 60 H.P. Send for Catalog.

A. MIETZ, 128-138 Mott St., New York.



The Stickney Junior 3 H. P. Gasoline Engine works Forge, Trip Hammer, Drill, Emery Wheel, Jointer, Lathe and Polisher. The Blacksmith who has a "Stickney Junior" makes and keeps trade.

Write for catalogue and prices to any of the following general agents

Parlin & Orendorff Co., Omaha, Kansas City, Denver, St. Louis and Dallas. Dean & Co., Minneapolis. S. D. Burke & Co., Madison, Wis. Western Iron Works, Los Angeles. Puget Sound Mach. Depot, Seattle, Wash. E. G. Prior & Co., Ltd., Victoria, B.C., Can. Jos. Maw & Co., Ltd., Winnepeg, Manitoba. Scobie & Parker Co., Pittsburg, Pa. Isch & Ditewig, Peoria, Ill. Clot & Crist Machine Co., San Francisco. Reierson Machinery Co., Portland, Ore. Bradley Engineering and Machinery Co., Spokane, Wash. Utah Implement Co., Salt Lake City, Utah. Merrell & Co., Toledo, O. Griffith & Turner Co., Baltimore, Md. Mitchell Implement Co., Ft. Dodge, Ia.

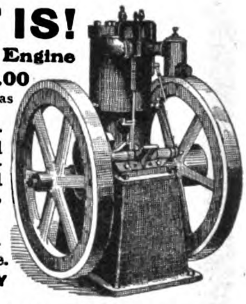
Or Chas. A. Stickney Co., Makers, St. Paul, Minn.

Well! Well! Look Here!

HERE IT IS!

A 1 H. P. Gasoline Engine Complete, $70.00

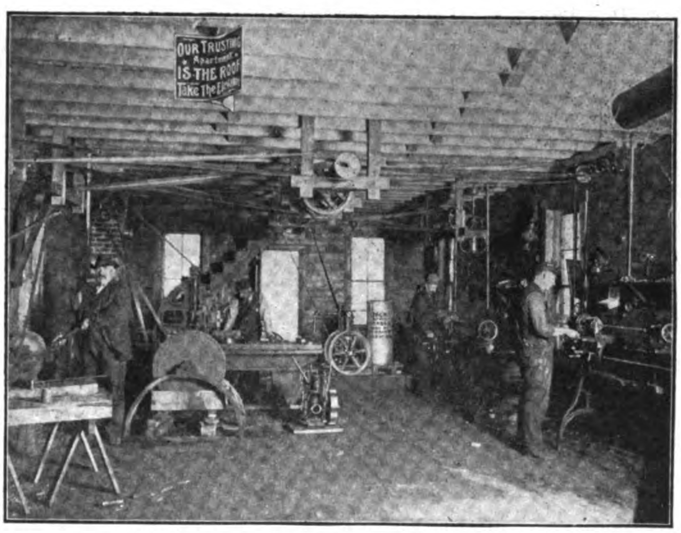
Four other sizes equally as cheap



WRITE at once for catalogue telling all about the IXL Stationary, Marine and Automobile Engines, Transmissions and Differential Gears. Builders of the KALAMAZOO Automobile.

ALL GOODS FULLY GUARANTEED

THE BURTT MFG. COMPANY, KALAMAZOO, MICH.



Owner, D. B. Young & Co., Culver, Ind. Mr. Young says. "The Fairbanks-Morse 2 H.P. Engine runs an Emery Wheel, 18x6 Engine Lathe, 13x5 Engine Lathe, 24x24x7 Planer, Drill Press, Grind Stone, Wood Lathe and Scroll Saw. Have run them all at once and could do it steady if we had work to do on them. Have been running my engine two years and have not done 25 cents' worth of repairing on it and have not been delayed an hour by its being out of order.

Every Model Blacksmith Shop Needs Power.....

FAIRBANKS-MORSE GAS, GASOLINE AND OIL ENGINES, (2 to 150 h.p.) ALWAYS DEVELOP MORE THAN THEIR FULL RATED HORSEPOWER

Over **30,000** in Use

SEND FOR SPECIAL CATALOGUE.

FAIRBANKS-MORSE & Co.,

MANUFACTURERS.

Chicago	Cincinnati	Denver
Cleveland	St. Louis	Los Angeles
Detroit	Kansas City	San Francisco
Louisville	St Paul	Portland
Indianapolis	Minneapolis	Salt Lake City
New York	Omaha	London, Eng.

WEBER

WEBER GAS AND GASOLINE ENGINES

WEBER

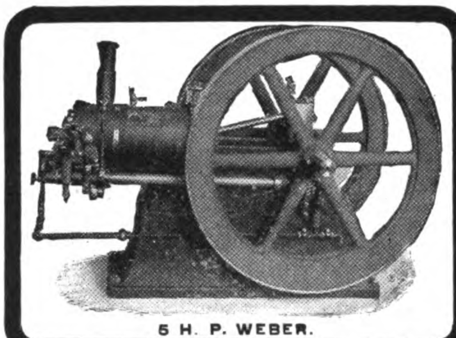
Weber Facts:

We build engines from 2½ up to 300 horsepower.

Our 2½ and 5 H. P. engines are especially suited for blacksmith, wagon builder and repair shops.

Twenty years' experience is back of Weber engines.

The Weber Junior is admitted to be the most popular engine for blacksmiths, Over **8,000** now in use making money for their owners every day.



5 H. P. WEBER.

Weber Facts:

Only the very best material and workmanship go into **Weber Engines.**

They stand the test of long, severe service.

Every engine is rigidly tested before leaving the shop.

Anyone can operate a **Weber Engine,** they require but a few minutes' attention each day.

Every person who uses our engine indorses it.

WEBER ENGINES ARE ABSOLUTELY SAFE.

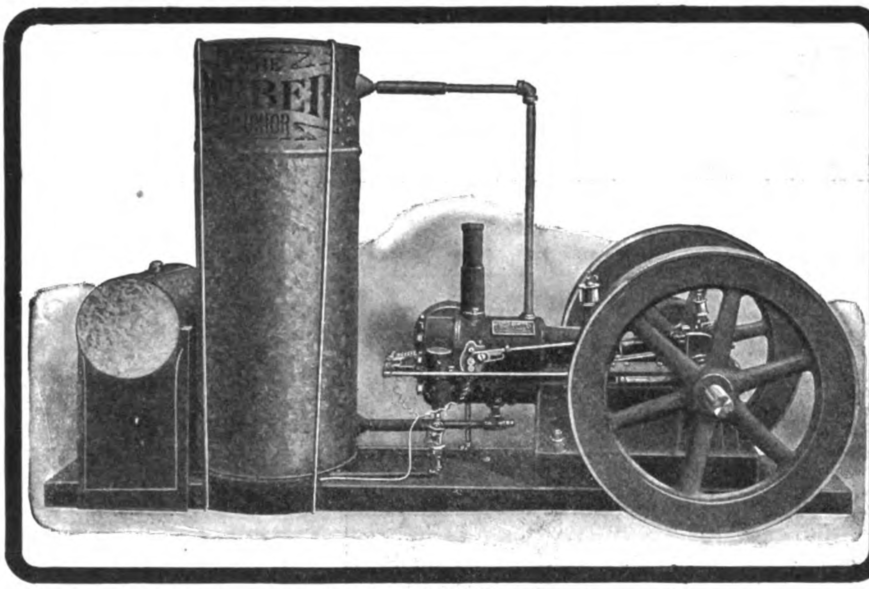
GUARANTEE.

All Weber Engines are guaranteed to be of the very best material and the very best workmanship, and we hereby agree to replace any part found defective f. o. b. our works without cost for a period of two years.

We guarantee the consumption of fuel as noted below. We guarantee the speed to be steady and uniform. We guarantee that changes in temperature will not affect the engine's running. We guarantee interchangeability of parts. We guarantee that the Weber can be operated without constant regulation of the throttle valve.

Weber Engines operate on one-tenth of one gallon of gasoline per horsepower per hour.

Safe
Solid
Strong
and
Simple



Durable
Compact
Complete
and
Economical

The Junior shown above is shipped (crated) with all fixtures attached ready to set up and run, requiring no pipe fitting or connections—it is HORIZONTAL, not Vertical. A horizontal engine is stiffer, safer, stronger and will last longer than any vertical engine on earth.

Terse Testimonials:

From Knight & Powell, Childress, Tex.:—"About a year ago we put in a 2½ H. P. Weber to drive band saw, rip saw, grindstone, disc sharpener, drill press and blower for three fires. We have never regretted it one minute since. Our trade has increased wonderfully." Geo. G. Simonson, Cunningham, Kan.:—"If you are thinking of putting in power, buy a Weber 2½ H. P. Engine; it has all the power you want to run a blacksmith shop, and to spare." J. H. McCord, Beaver Crossing, Nebr.:—"Everyone who sees your 5 H. P. engine says it is the most perfect and smoothest running engine they ever saw. Anyone wanting five horsepower, I would advise to buy a Weber 5 H. P. engine." John Donnelly, Branford, Ct.:—"I am the owner of the best and cheapest gasoline engine built—the Weber Junior. I have never spent a penny for repairs." S. G. Mooney, Coffeyburg, Mo.:—"I have a 2½ H. P. Weber engine, and it is a dandy. I doubt if there is any better engine made than the Weber." We have received hundreds upon hundreds of just such letters as these.

Send Postal today for our Complete and Interesting Catalogue, FREE.

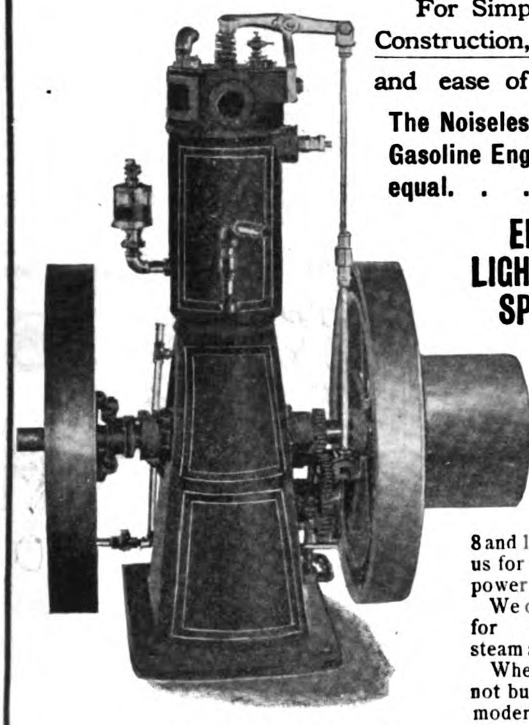
WEBER

Weber Gas and Gasoline Engine Company

P. O. Box V 1114, Kansas City, Mo.

New York Office: 115 Liberty St., N. Y. C.

WEBER



For Simplicity of Construction, Durability and ease of Operation

The Noiseless Gas and Gasoline Engine has no equal. . . . . .

ELECTRIC LIGHTING OUR SPECIALTY

Making them equally desirable for general work, such as running shop, grinding, sawing wood, etc. Made in 3, 6, 8 and 12 H.P. Write us for prices giving power required.

We often exchange for old engines, steam and otherwise.

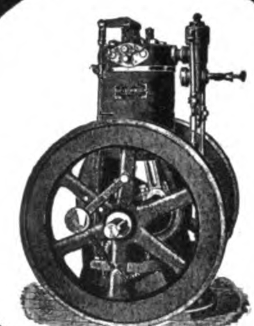
When buying, why not buy the best at a moderate cost?

AGENTS WANTED IN EVERY TOWN.

Peerless Motor Co.

MAKERS. LANSING, MICH., U. S. A.

The Gas and Gasoline Engine City of the World.



You Never Saw...

A Neater, More Business-like Gasoline Engine than the

BATES & EDMONDS.

WE SAY

No smith shop complete without power.
No power so handy as a gasoline engine.
No gasoline engine as good as the BATES & EDMONDS.

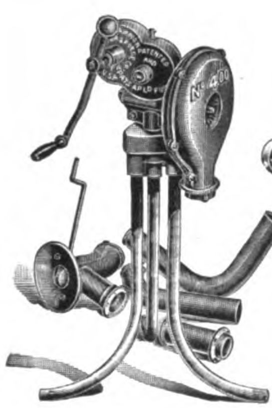
Our specialty is 1½, 2½ and 4 H. P. Engines. How much power do you need? Let us send catalogue and quote prices.

If you have a steam engine, give full description—we sometimes make exchanges. Any number of Blacksmiths are using our engine and swear by it. Let us tell you more about it.

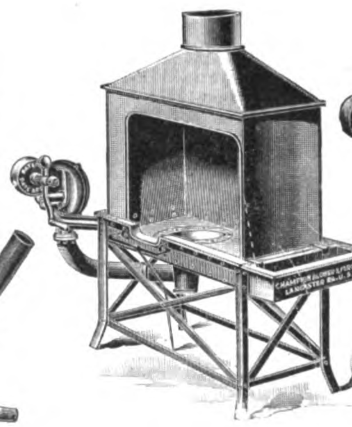
Bates & Edmonds Motor Co.

LANSING, MICHIGAN.

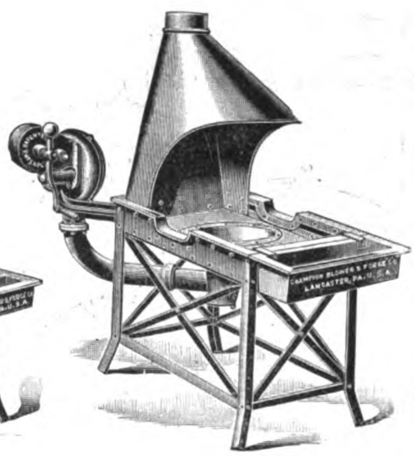
We Carry in Stock *120 DIFFERENT STYLES and Sizes of the CHAMPION BLOWER & FORGE CO.'S Blowers, Forges, Drill Presses, Tire Benders, Tire Shrinkers, Screw Plates and Power Blowers.*



No. 400



No. 408½



No. 408

No. 401

If you are looking for an up-to-date Blower or Forge, we can recommend (without question) the No 400 Champion Blowers and Steel Forges We have sold thousands of them in the last five years. They give a blacksmith a hand blast equal to a Blower run by power. We also carry a complete stock of Blacksmiths' and Horse-Shoers' Tools and Supplies.

Uptown Branch: 232 E. 125th ST. Telephone Connection.

VOUGHT & WILLIAMS,

363, 365 and 367 Greenwich Street,

Between Franklin and Harrison Streets, ***NEW YORK CITY.***

IRON, STEEL AND BLACKSMITHS' SUPPLIES.

ECLIPSE
GAS AND GASOLINE ENGINES.

Vertical 2, 3, 4, 5, H. P.
Horizontal 5, 10, 12, 15, 20, 25, H. P.

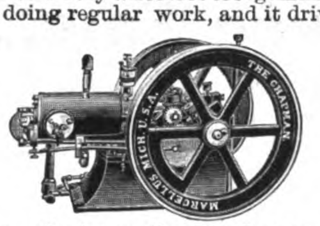
Designed and Built for BUSINESS.
Catalogue on request. . . . . . .

MYRICK MACHINE CO., Olean, N.Y.

THIS IS OUR SPECIALTY

IT IS 1½ HORSE-POWER GOOD AND STRONG

It drives 50 feet of line shaft, one 20-inch x 14 feet engine lathe, one 24-inch drill press, one power hack saw, one bolt threading machine, cutting threads on half-inch bolts, and one 10-inch emery wheel for tool grinding, all doing regular work, and it drives

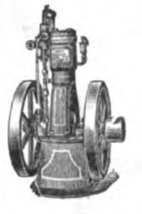


them all at one time ten hours per day, with less than one and one-half gallons of gasoline and still has power to spare.

Can you afford to do without power in your shop? The quality is right and the price is right.

Address—
CHAPMAN FORGE AND ENGINE WORKS
Marcellus, Mich.

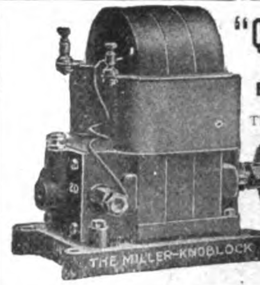
Regal Engines.



Jump Spark Ignition Four Cycle Type.
2 H. P. and 4 H. P.

Stationary and Marine. Up-to-date and absolutely reliable. Do you know what that means? Write for catalogue "12."

Regal Gasoline Engine Co.
COLDWATER, MICH.



"QUICK ACTION"
IGNITING DYNAMOS EXCEL ALL OTHERS!

The only generator that cannot lose its magnetism For either make and break, or jump spark work. Also spark coils. Send for Catalogue B.

The Miller-Knoblock Electric Mfg. Co.
SOUTH BEND, IND.

Hundreds and Hundreds of Blacksmiths will tell you that for Reliability, Durability and Economy

LENNOX ENGINES

HAVE STOOD THE TEST

Vertical Type, 2 and 3 Horse-power

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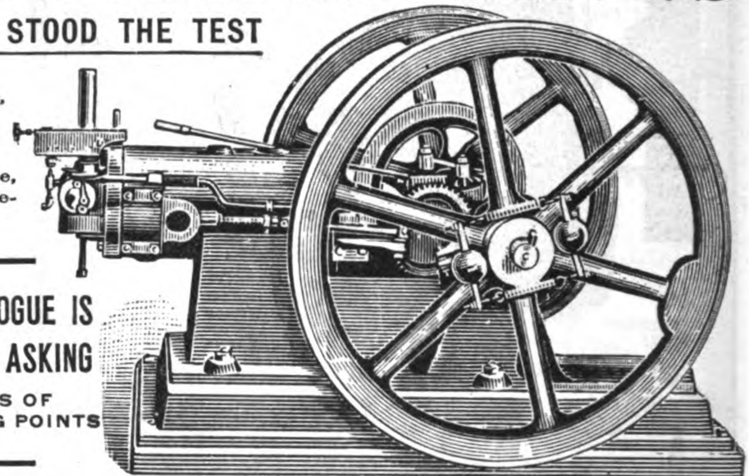
OUR CATALOGUE IS FREE FOR ASKING

HAS LOTS OF INTERESTING POINTS



Two up to Twenty-five Horse-power

Lennox Machine Co. Marshalltown Ohio

For $85 We'll sell you the best Gasoline Engine ever made The Chicago

POWER FOR ALL PURPOSES

Full Two Horse-power. While we only claim two horse, this engine will develop full 2½ H. P. We guarantee it to develop more power than ordinary engines claiming 3 H. P. If you want a 2½ engine it is perfectly safe to order our 2 H. P.

We make Four Sizes. 2 H. P. at $85, 3 H. P. $125, 5 H. P. $190, 7½ H. P. $275. The engines are alike in every way.

They are Complete in Every Way. All are erected on wood base and self-contained (excepting the 7½ horse-power. They are furnished complete with electric igniter, water and gasoline tanks, batteries, connected, ready to run. Each engine is thoroughly tested.

The Igniter is electric and absolutely positive in its action. We have made igniters a special study and have adopted one of our own design, which has no equal in simplicity and efficiency. The electric spark, such as we use, is superior in every way. It is ready to start instantly, while the hot tube igniter is always causing delay and trouble.

The Batteries. Every engine is fitted with a complete set of dry batteries, the most effective made. This style of battery is far superior to the old style wet battery because of the expense it saves.

The Governor is the most simple and effective made. Speed of engine may be changed while running.

The Balance Wheels are very heavy, turned, polished and faced on both sides.

Fuel Consumed. The CHICAGO Gasoline Engine consumes less fuel for the power developed, than any other gasoline engine made for the reason that our engine is built on scientific principles, and all friction eliminated.

Safety. There is absolutely no danger of an explosion when you use a CHICAGO. You can pour gasoline all over the engine, while it is running, and there would be no explosion.

Speed. The maximum speed of the 2 H. P. engine is 400 revolutions per minute; 3 H. P., 350; 5 H.-P., 320; 7½ H.-P., 300. Engines are fitted with suitable sized pulley.

GUARANTEE.

We *guarantee* each and every CHICAGO Gasoline Engine to be perfect in every way, shape and manner. If any part gives out, or breaks within one year from date of purchase on account of poor material or workmanship, parts will be furnished free. We *guarantee* that our 2 H.-P. engine will actually develop more power than most any engine that is rated at 3 H.-P. We *guarantee* each and every size to develop all or more power than we claim for them. We *guarantee* to develop the same amount of power, with less fuel, than with any other engine made, because we have no unnecessary friction, no lost motion and absolutely the most simple, perfect and economical engine ever made.

OUR LARGE COMPLETE CATALOGUE gives large illustrations, full descriptions and more information on gasoline engines than was ever given before. We have revolutionized the gasoline engine business. Our 16-page book tells you what we have learned in 14 years' experience. Write for free catalogue.

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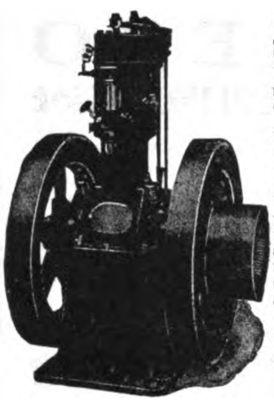
DON'T BUY GASOLINE ENGINES until you have investigated "THE MASTER WORKMAN," a two-cylinder gasoline engine, superior to all one-cylinder engines. Cost less to buy and less to run. Quicker and easier started. Has a wider sphere of usefulness. Has little or no vibration. Can be placed anywhere without expense for foundation. Weighs less than one-half the weight of one-cylinder engines. Please give size of engine required. We make 2, 4, 6, 8, 10, 12 and 16 horse-power. Please mention this paper. Send for catalogue.
THE TEMPLE PUMP CO., Established 1853. Meagher and 15th Streets, CHICAGO.



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But investigate the merits of the Buick Gas and Gasoline and Automobile Engines before buying Adapted for all classes of work. Noted for its simplicity and durability, close regulation of power and regularity of speed and low cost of running. Absolutely guaranteed.

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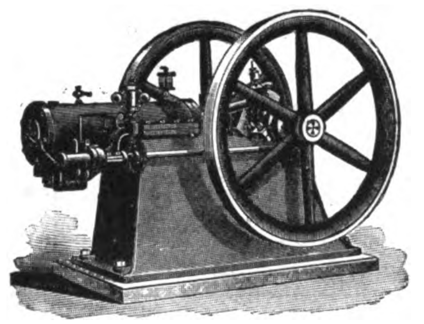
ARE THE THINGS FOR BLACKSMITHS



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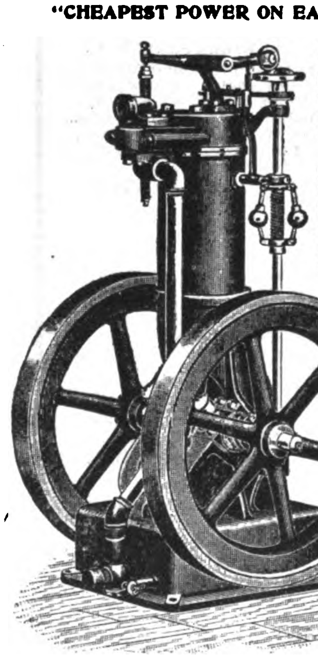
COLUMBUS MACHINE COMPANY,
Columbus, Ohio.

"WINNEBAGO CHIEF"

"CHEAPEST POWER ON EARTH."



Built in 2 and 3 H. P. Simplest, strongest and most reliable engine in the market. Satisfaction guaranteed or engines taken back. Prices so low you can't afford to do without.

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LIGHTNING WELL MACHY
IS THE STANDARD
STEAM PUMPS, AIR LIFTS,
GASOLINE ENGINES
WRITE FOR CIRCULAR
THE AMERICAN WELL WORKS
AURORA, ILL.—CHICAGO.—DALLAS, TEX.

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"Gas Power"

Solves Gas Engine Troubles

If you are interested in gas engines or power

YOU NEED IT.

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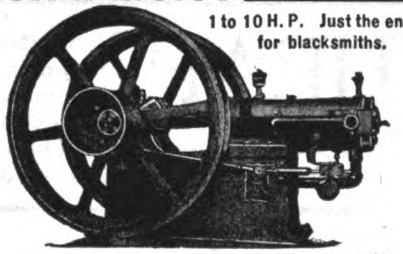
SIMPLICITY is one of the fine points of the HARTIG ENGINE.

1 to 10 H. P. Just the engine for blacksmiths.



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14 Commercial Street, Newark, N. J.

Vertical and Horizontal Engines
FROM 2 to 20 HORSEPOWER

Stationary and Portable
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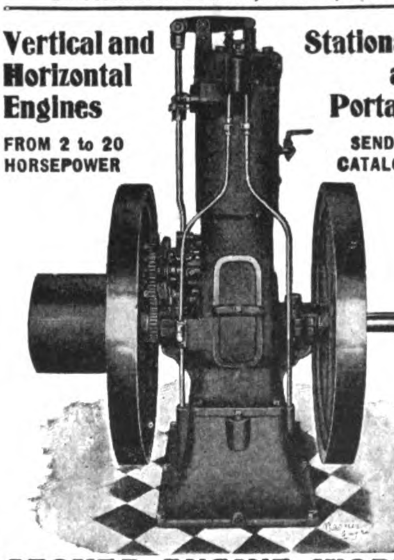

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To Owners of Gasoline Engines, Automobiles, Launches, Etc.

The **Auto-Sparker**

does away entirely with all starting and running batteries, their annoyance and expense. No belt—no switch—no batteries. Can be attached to any engine now using batteries. Fully guaranteed.

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BARGAINS In Rebuilt Second-hand *GASOLINE ENGINES*

Good as New
Also New Gas and Gasoline Engine

GET MY PRICES

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YOU CAN RELY
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Hoosier Gasoline Engine
to give perfect satisfaction even when running continuously at full load. . .

Requires little attention and no repairs.

Finest Material and Best Workmanship.

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Write for our free catalogue giving full description.

CAPITAL GAS ENGINE CO.
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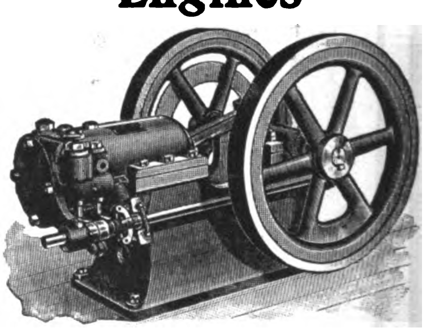
Gas and Gasoline Engines



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The New Era Iron Works Co.
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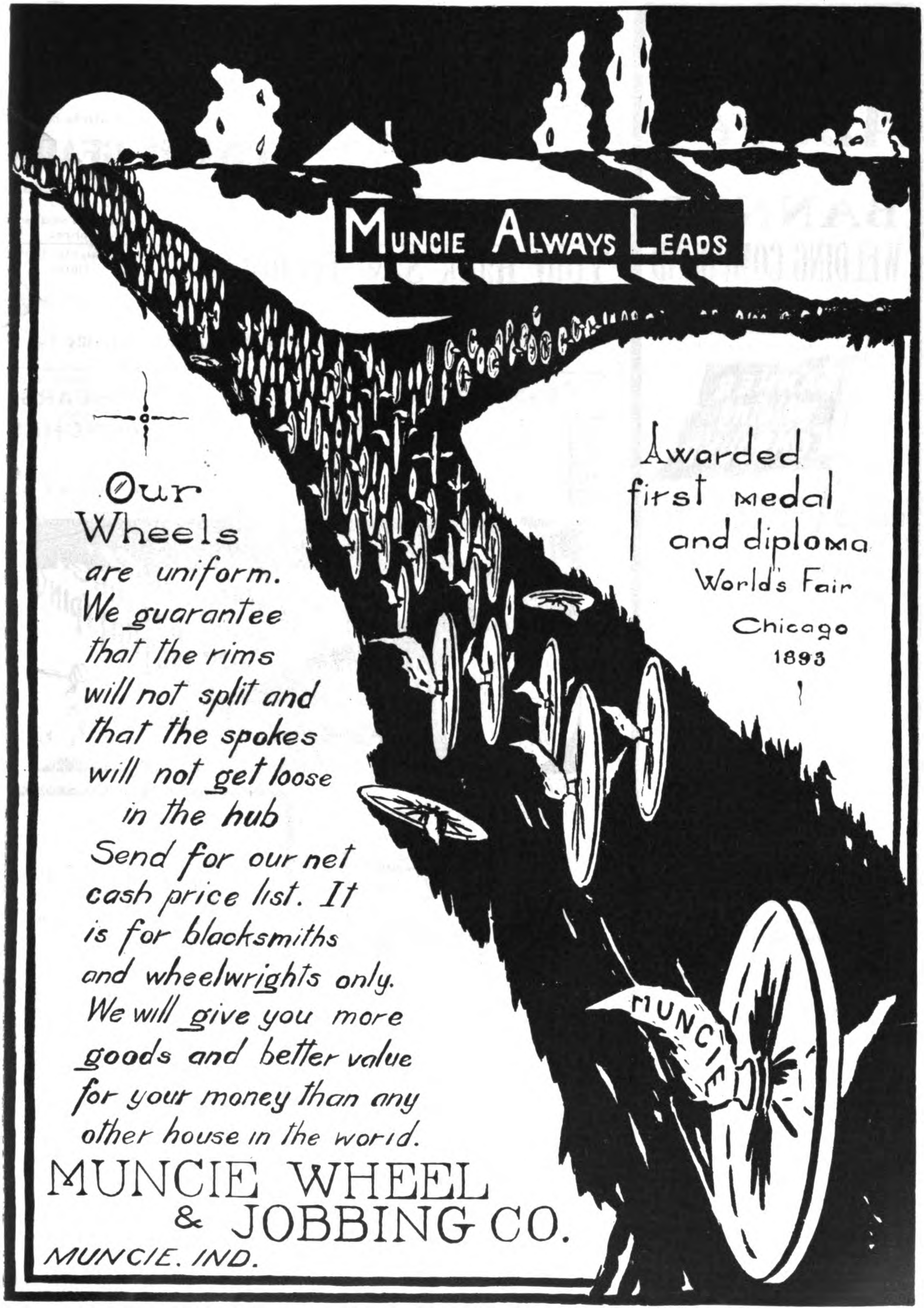
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Awarded first medal and diploma World's Fair Chicago 1893
Our Wheels are uniform. We guarantee that the rims will not split and that the spokes will not get loose in the hub
Send for our net cash price list. It is for blacksmiths and wheelwrights only.
We will give you more goods and better value for your money than any other house in the world.
MUNCIE
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High Above

all others stands our

BANNER WELDING COMPOUND

Higher in efficiency,
Higher in ease of handling,
Higher and Superior in every respect except price.

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GUARANTEED

Banner Welding Compound is indeed an old and reliable blacksmith's friend.

The No. 3 A, for welding axles, springs, steel tire and all kinds of welding. Medium fine grain.
The No. 4 Banner Borax Substitute; sixty-five per cent. saving over Borax. Leaves smoother surface and a better weld for tools, scissors, etc. Does not loose off in the fire like Borax. Fine powder.
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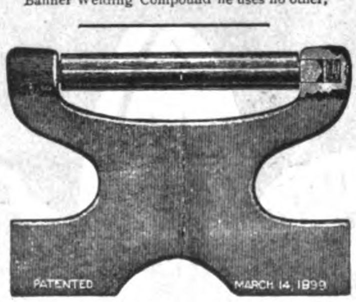
The Banner Welding Compound welds tool steel to common iron or tool steel to malleable iron very readily at a low heat. Guaranteed the best welding compound made or money refunded.

WE PRESENT FREE

to any blacksmith who has never used our compound

A FINE LEATHER APRON WORTH $1.50

on receipt of an order for 20 pounds of any of the above numbers and $2.00 in payment of same. We can afford to do this to introduce our goods, because once a blacksmith tries Banner Welding Compound he uses no other,



This cut shows, 3/8 size, our Standard ROLLER CHAFE IRON for end spring buggies. We make all styles, but this one sells faster than we can make them. No rattle, bind, squeak, wear or trouble. The best builders all over the country are using them. Send for circular, prices and special discounts.

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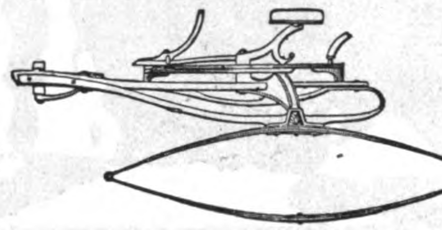
Builders of all kinds of

COACH GEARS

And Forgings for the Trade

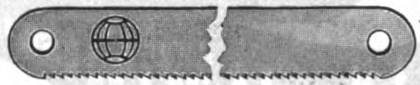


HEARSE CARRIAGE GEAR WITH IRON TOP BED

Tell us what you want, and you will get it. Write us at once.

Your Hack Saw Troubles

will come to an end if you get the old reliable Universal brand.



Send for our free booklet with hints on the use of the hack saw.

West Haven Manufacturing Co.
NEW HAVEN, CONN.

Steel Stamps.

Steel Letters and Figures

Burning Brands

Stencil Dies, Stencils, etc.
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We Manufacture

SHEARS AND PUNCHES

Hand or power, for shearing and punching plates, bars and angles. Send for Catalogue C.
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To an Advertiser, please mention
THE AMERICAN BLACKSMITH.

A Letter Filing System That Almost Thinks—

that grows as your business grows and changes with your needs. Files alphabetically, numerically by dates or by subjects. And a girl at $4.00 a week can handle it.

$19.75 Buys a two file section with top and base indexes, folders and card system complete. The outfit holds more letters than eighteen old style flat sheet cabinet drawers. The case is built by skilled cabinet makers from the finest quarter-sawed white oak. It is highly finished and fitted with patented Shaw-Walker appliances. The cards, folders and indexes are of double strength card board.

The outfit is shipped on approval. A week's study of printed matter can't begin to teach you what you'll learn from it. We simply ask you to try it. If not satisfactory, return *at our expense*. Write today.

Ask for catalog A of card systems—B of letter document and catalog files—N of sectional bookcases. Any or all are free.

SHAW-WALKER
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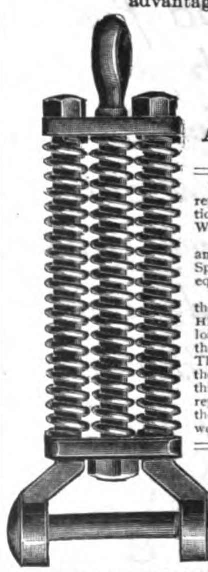
A QUICK AND READY SALE

Follows an explanation of the advantages of

Beecher Draught Springs



All wagon owners need them.

We want agents. Will you represent us? Our proposition is particularly pleasing. Write for circulars.
For simplicity, durability and usefulness, our Draught Springs simply cannot be equalled.
They act as a cushion to the horses' shoulders, they HELP horses START heavy loads. they assist in drawing the load after it is in motion They prevent collar wounds, they save from twenty to thirty per cent. in harness repairs, prolong the life of the team and increase their working capacity.

You can make money as well as please your customers by selling our Springs.

BEECHER DRAUGHT SPRING CO.
NEW HAVEN, CONN.

BOLT CLIPPERS.

CHAMBERS BROS. CO.,
N. FIFTY-SECOND STREET,
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EACH ONE GUARANTEED.

Newton's Heave, Cough, Distemper and Indigestion Cure. A veterinary specific for wind, throat and stomach troubles. Strong recommends. $1 per can. Dealers, mail or Ex. paid. Newton Horse Remedy Co. (3) Toledo, Ohio.

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Send postal for particulars. Let us tell you our special plans for helping our agents. Do you want to represent us? Address

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Lathes and Drill Presses

Especially for Blacksmiths and Machinists, also Hand and Power Planers and Shapers and Machinists' Supplies.

Catalogue M.

SHEPARD LATHE CO., 132 W. 2d St., Cincinnati, O.

"Cherry Heat" Welding Compound.

Introduced in 1873.

We would hereby inform Ironworkers and the trade, that sales of this compound for 1903 were the largest in the history of the business.

The Welding Compound Co.

Paterson, N. J.

ONLY 60 CENTS Did you ever try to shoe a horse that would not stand still? By the use of my great ***Pulley Breaking Bridle*** you can make the most restless horse stand as quiet as a lamb—even ugly horses, stallions, etc., completely subdued while being shod. Price, **Only 60c postpaid.** You should own one.

Will bring business to you. Send for circular telling all about it.
PROF. JESSE V. BEERY, PLEASANT HILL, OHIO.

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Ever Send Out circular letters to the TRADE? Our imitation typewritten letters absolutely cannot be distinguished from the real. They are the kind that get attention that bring results. Send for free samples'

ONLY HIGH-GRADE WORK DONE.

Climax Welding Compound

Welds all kinds of Steel as easily as Iron

Sample Free

For sale by dealers in Blacksmith's Supplies.

Manufactured only by

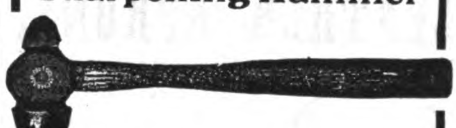
CORTLAND WELDING COMPOUND CO.

CORTLAND, N. Y.

EVERY BLOW COUNTS

When you are Using an

Electric Sharpening Hammer



The roughened surface of the pein prevents calk from slipping away from the anvil.

If you want a finely balanced, rapid working hammer, try the **Electric Sharpening.** A pleasure to use it.

NOTE.—We have just issued an attractive hanger, giving Weights and measurements for cutting iron or steel for making certain weights of shoes. Sent free on request to any address. Our new tool catalogue is also yours for the asking.

CHAMPION TOOL CO.
(LIMITED)
Conneaut Lake, Pa., U. S. A.

STAR HORSE SHOEING RACK......

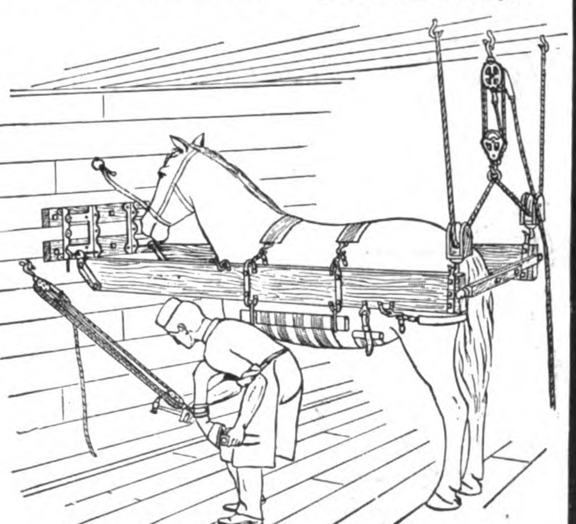
Strong and **quick** to operate. Perfect **safety** both to horse and man.

Hundreds in use now.

Any foot, hind or fore, can be handled with equal **ease**, and by an automatic device.

WRITE US,

for circular, which will tell you ALL about this Rack.



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HUNT, HELM, FERRIS & CO.

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2 feet long, ¾ inches wide, folding in middle. Made of Best Quality Spring Tempered Steel

BLACKSMITHS Will find this Steel Rule just what they need. We send it post-paid for 50 cents.

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We make sixty different styles of gears for all kinds of vehicles, and a full line of surries, buggies, road and pleasure wagons in the white; also bodies for buggies, surries and automobiles, stick seats, tops, trimmings, etc.

One of many patterns—naked axle construction, solid forged rear perch ends, solid forged, new style, Brewster fifth wheel.

New 56-page Catalogue ready Free. Send for it.

SCHUBERT BROS. GEAR CO., Oneida, N. Y.

Will turn off blue chips on any kind of work.

Firth-Sterling Steel Co.

PITTSBURGH.

Selling Agencies:

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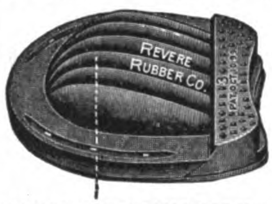
We Furnish Wheels

with Rubber Tires on for the same price as others charge for re-rubbering old wheels. We furnish all sizes with steel or rubber tire. . . . . .
You are not prepared to meet competition without our prices. . . . . . .

Write quick for catalogue

AIR CUSHION RUBBER HORSESHOE PADS



THE MOST COMPLETE
Line of PADS On Earth

Air Cushion, Banner, Acme, Giant, Ideal, A. C. Road, and Racing.

CHEAPEST ON THE MARKET.

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SEE THAT CUSHION?
It fills with air at each step.
That's what breaks concussion.
That's what prevents slipping.
That's what keeps the foot healthy.
That's what cures lameness.

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MANUFACTURERS **BOSTON, MASS.**

LEATHER APRONS.

Sold by all Jobbers in the United States and Canada.

Minature Aprons, showing material and how made, mailed **FREE** upon application.

Size 30x36, $1.50 Size 26x33, $1.25
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DELIVERED ANYWHERE IN THE UNITED STATES AND CANADA. MONEY MUST ACCOMPANY ORDER.

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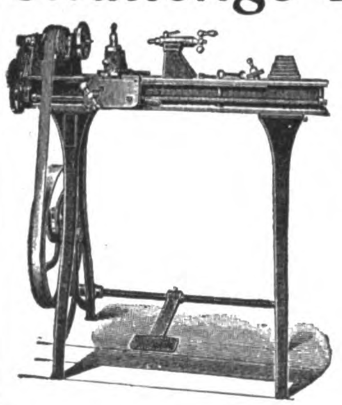
This is our 9x25 Challenge Lathe IT IS YOURS FOR ONLY $35



Can you afford to be without this screw cutting, backgeared, improved foot or power lathe? It uses extra wide belt, preventing slip on heavy cut. Cuts right or left hand threads, 3 to 40 to inch. Has hollow spindle and many improvements. It is up-to-date. Price includes lathe complete with face plate, centres, wrenches and full set of change gears Buy one and try it and return at our expense if not satisfied

WRITE FOR CIRCULAR OF OUR FULL LINE OF MACHINE TOOLS

THE CARROLL-JAMIESON MACHINE TOOL COMPANY
BATAVIA, OHIO, U. S. A.

NOTE.—The Royal Blower is made by the Canedy-Otto Manufacturing Company, Chicago Heights, Illinois. This concern has won a most enviable reputation in the manufacture of FORGES, BLOWERS and DRILLS, and their name on an article is of itself a full guarantee. Wherever civilized man is engaged in construction work, there also will be found the "Royal" and "Western Chief" Forges, Blowers and Drills of these people helping to lighten labor. Their product may be found on sale with the principal dealers everywhere, or a request to them direct for Catalogue will bring full information.

100,000 No. 400 Champion Steel Blowers and Forges NOW IN USE,

With Spiral Gearing as it Works in the No. 400 Steel Blower.
The No. 400 Champion Steel Blowers and Forges

Hold the **great honor** of being the only Blacksmith Blowers and Forges ever built with **SPIRAL GEARING fully** covered by **Letters Patent.**

WHAT is Spiral Gearing? WHY is Spiral Gearing the only DURABLE High Speed Gearing that can be manufactured?

Will Save from Five to Ten Times its Cost

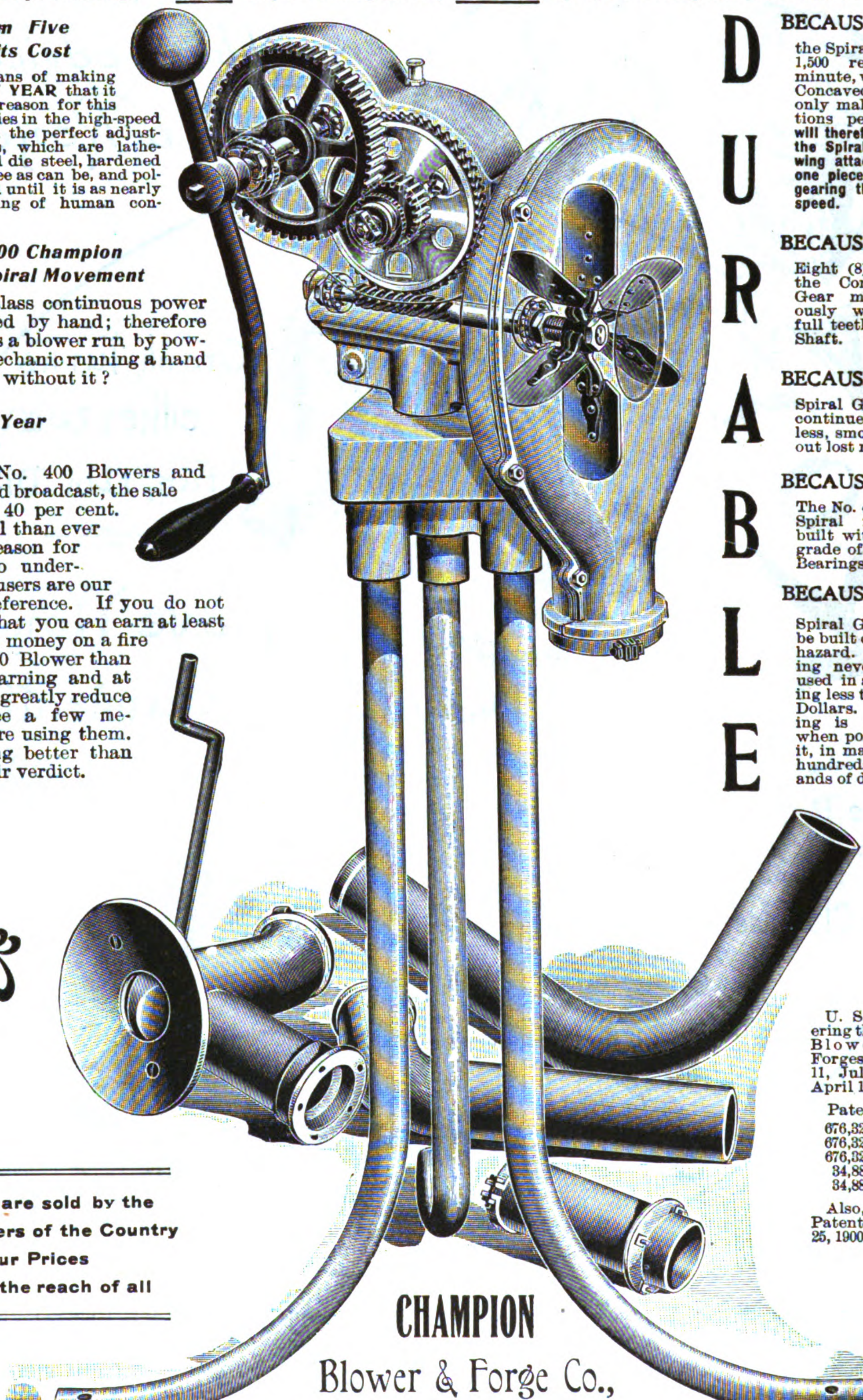
over any other means of making hand blast **EVERY YEAR** that it is used. And the reason for this wonderful work lies in the high-speed spiral gearing and the perfect adjustable ball-bearings, which are lathe-turned from solid die steel, hardened to as great a degree as can be, and polished and finished until it is as nearly perfect as anything of human construction can be.

With the No. 400 Champion High-Speed Spiral Movement

a strictly first-class continuous power blast is obtained by hand; therefore its only equal is a blower run by power. Can any mechanic running a hand fire afford to do without it?

In Their Fifth Year Among Users

with 100,000 No. 400 Blowers and Forges scattered broadcast, the sale on them was 40 per cent. greater this Fall than ever before. The reason for this is easy to understand, as their users are our standby and reference. If you do not already know that you can earn at least one-third more money on a fire run by a No. 400 Blower than you are now earning and at the same time greatly reduce your labor, see a few mechanics who are using them. We ask nothing better than to stand by their verdict.



D U R A B L E

BECAUSE

the Spiral Shaft makes 1,500 revolutions per minute, while the 6-inch Concaved Spiral Gear only makes 185 revolutions per minute. **It will therefore be seen that the Spiral Shaft, with fan wing attached, is the only one piece of the entire gearing that runs at high speed.**

BECAUSE

Eight (8) full teeth of the Concaved Spiral Gear mesh continuously with eight (8) full teeth of the Spiral Shaft.

BECAUSE

Spiral Gearing always continues to run noiseless, smooth and without lost motion.

BECAUSE

The No. 400 High Speed Spiral movement is built with the highest grade of **adjustable** Ball Bearings.

BECAUSE

Spiral Gearing cannot be built cheap and haphazard. Spiral Gearing never before was used in a machine costing less than Fifty ($50) Dollars. Spiral Gearing is always used, when possible to apply it, in machines costing hundreds and thousands of dollars.

U. S. Patents covering the No. 400 Steel Blower and Steel Forges granted June 11, July 30, 1901, and April 15, 1902.

Patent Numbers:

676,322	34,882
676,323	34,883
676,324	34,884
34,880	34,885
34,881	697,629

Also, Great Britain Patent No. 9,662, May 25, 1900.

Our Goods are sold by the Leading Jobbers of the Country and our Prices are within the reach of all

CHAMPION

Blower & Forge Co.,

LANCASTER, PA. U. S. A.

VOLUME 3 NUMBER 12

THE AMERICAN BLACKSMITH

BUFFALO N.Y. U.S.A.

A PRACTICAL JOURNAL OF BLACKSMITHING

SEPTEMBER, 1904

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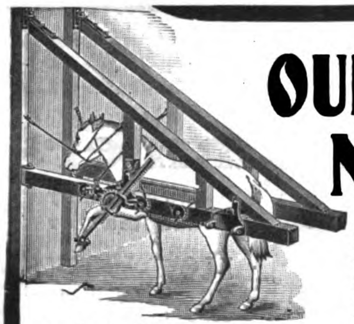
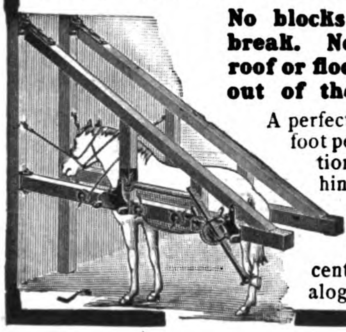


OUR RECENT NEW MOVE

into larger and finer quarters at Wabash was made necessary by an increasing demand for Barcus Stocks from all parts of the world. The demand is due simply to the fact that it is a practical machine, built for every-day use by practical shoers.

Geo. Barcus & Company
Wabash, Ind., U. S. A.
Canadian Horse Stock Co., Hamilton, Ontario, Canada

BARCUS HORSE STOCKS
THE MOST EASILY OPERATED



No blocks and tackle to tangle and break. No cumbersome bracing to roof or floor. The frames swing back out of the way when not in use.

A perfect, automatic device to hold the foot perfectly solid in any desired position. Leg arm can be changed from hind to fore foot, either side, in thirty seconds. The Barcus Stocks, always the best, have been made better than ever by many recent improvements. Send for catalogue—FREE.

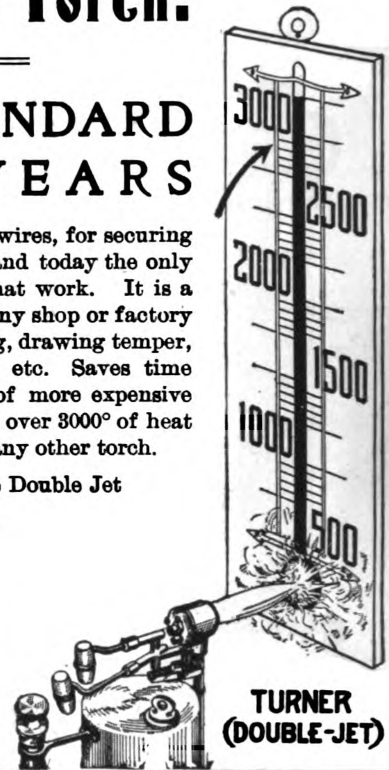
The Turner Double Jet
Gasoline Torch.

THE STANDARD FOR 7 YEARS

for brazing retaining wires, for securing rubber vehicle tires, and today the only torch suitable for that work. It is a handy appliance for any shop or factory for brazing, tempering, drawing temper, annealing, soldering, etc. Saves time and takes the place of more expensive appliances. Produces over 3000° of heat and 1000° more than any other torch.

Be sure you get the Double Jet

Send for catalogue.



THE TURNER BRASS WORKS
63 No. Franklin Street, CHICAGO.

TURNER (DOUBLE-JET)

FOOT POWER HAMMER.

THE C. E. SUTTON COMPANY,

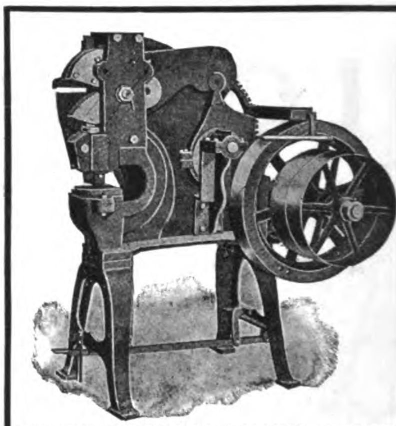
TOLEDO, OHIO, U. S. A.

Manufacturers of

Foot Power Hammers, Punches and Shears for all purposes. Either Hand or Power.

Forging Machines in various sizes, all built upon Honor and sold on their Merit.

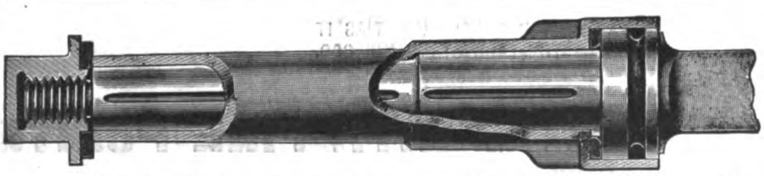
ASK FOR DESCRIPTIVE BULLETINS.



BLACKSMITH PUNCH AND SHEAR.

AN AXLE

Which is coming into favor again is here illustrated, the



Stivers Long Swell

We make it of either iron or steel, fitted with wrought or cast box, and a variety of nuts.

If you wish further particulars Write to the

DALZELL AXLE CO.,
South Egremont, Mass.

Why Spend Good Money

for a new anvil, when we can fix up your old one "good as new"?

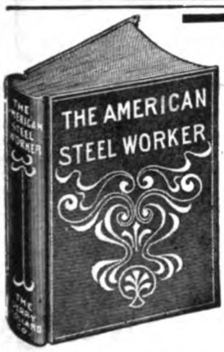
LOOK AT THIS

THEN AT THIS

WRITE FOR PRICES

We are experts at repairing old wrot anvils.

Columbus Anvil and Forging Co.
Frankfort St., COLUMBUS, OHIO



"BEST BOOK I EVER SAW"

Writes a blacksmith. Lots of others say so, too. Markham has been hardening steel for 27 years and studying it all the time. He tells in plain English just how to handle each case. Shows the best methods; but if you can't get them, it tells you how to do good work with what you have.

You can build a first class furnace if you want to from his plans and use any fuel you like.

Don't think you've got this information in other books—you haven't. It isn't there. Other books may read nicely and sound well, but none of the authors has had Markham's experience, and that's what counts.

343 pages, $2.50.
Money back if not satisfied, or sent on approval.

AMERICAN BLACKSMITH COMPANY,
P. O. Drawer 974. BUFFALO, N. Y.

MODERN POWER HAMMER

FOR
BLACKSMITHS AND IRON WORKERS

Used Daily Cures That "TIRED FEELING."

Height, 5 Feet.
Floor Space, 30x40 Inches.
Weight, 1200 Lbs.

Length of stroke changed instantly while running. The only hammer made that will strike a very light blow at full speed. All others slow down to get a light blow.

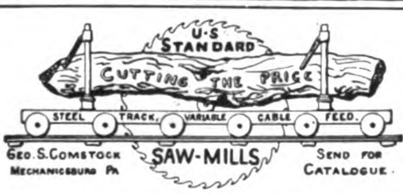
The "Modern" gives you any blow you want at any speed; hand lever controls the force of blow, foot treadle controls the speed.

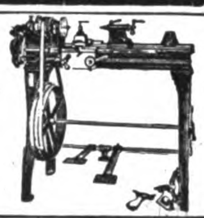
Long planed guides adjustable for wear. Cast steel hammer adjustable up and down to suit thickness of stock. Tool steel dies.

Greater range of work than any other hammer.

MANUFACTURED AND FULLY GUARANTEED.

GRINNELL MFG. CO.,
GRINNELL, IOWA.
SUCCESSORS TO THE KOCH MFG. CO.





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First-class Tools at reasonable prices. We build foot and power lathes from 9 in. to 15 in. Sensitive drills, emery grinders and wood lathes. Write for complete catalog. We guarantee to interest you.

THE CARROLL-JAMIESON MACHINE TOOL CO.
BATAVIA, OHIO - - U. S. A.

RUBBER TIRED **RUNABOUT, $35.00**

TOP BUGGY. $27.50

BUGGY TOPS, $4.50

Write for 100-page Catalogue. It's free. Compare Our Prices.
BUOB & SCHEU, Estab. 1883 500-520 EAST COURT ST. CINCINNATI, OHIO.

GEARS IN THE WHITE

Catalogue A

1,000 Styles and Sizes

THE AKRON-SELLE CO., Akron, O.

EATON Letter Company

73 W. Eagle St., Buffalo, N. Y.

Ever Send Out circular letters to the TRADE? Our imitation typewritten letters absolutely cannot be distinguished from the real. They are the kind that get attention, that bring results. Send for free samples.

ONLY HIGH-GRADE WORK DONE.

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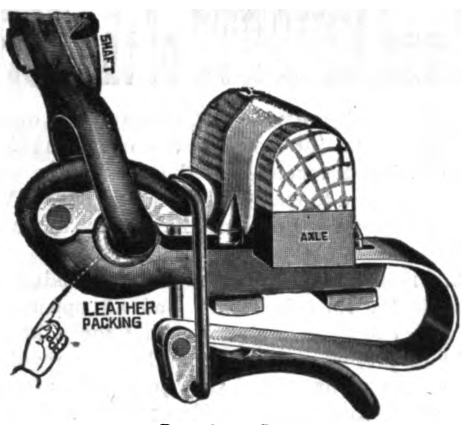


Coupling Closed

The Bradley Shaft Coupling

NEVER SQUEAKS or SIDE RATTLES

It cannot—for three reasons:

The leather packing is perfectly lubricated before it is put in the coupler.

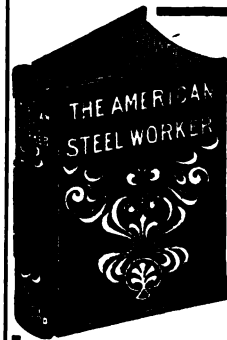
The ball and socket construction holds equally secure in all directions.

The constant and uniform pressure of the spring automatically takes up the wear.

These features are the most important in a Shaft Coupling because of the object attained—ABSOLUTE NOISELESSNESS—not for A time, but for ALL time.

C. C. Bradley & Son

SYRACUSE, N. Y.



Isn't it . . . about time

you took up the practical study of handling steel in Mr. Markham's course on Annealing, Hardening and Tempering? You've been putting it off, but its time to get busy NOW. We've arranged to give a copy of Mr. Markham's wonderderful book

The American Steel Worker

with each scholarship, and the whole thing costs you only $10 cash, or four monthly payments of $3 each. It's the best investment you ever made.

THE EDUCATIONAL ASSOCIATION

256-257 Broadway, NEW YORK.

BLACKSMITH'S VISES

AND THE

ANVIL

THAT

"Rings Like a Bell"

COLUMBUS FORGE & IRON CO.

Manufacturers

COLUMBUS, OHIO

HERMANN BOKER & CO.

Sole Sales Agents

101 Duane St., NEW YORK CITY

ANVIL RINGERS, HAMMER SWINGERS and KNIGHTS of the FORGE

WHETHER you be a blacksmith, a horsesmith, a repairsmith or wagonsmith, we think you will be interested in the novel and unusual opportunity told of in this announcement, and the one on the opposite page. We are sure it will pay you to read every word on page XV carefully and keep this copy handy, for we may not have space to make this announcement again.

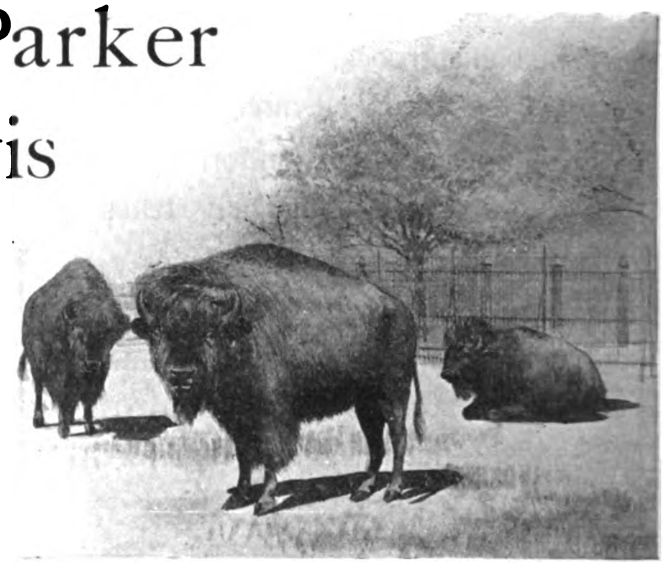
TO EXPLAIN, the American Blacksmith Company, in looking around for a News Year's souvenir for its subscribers, had an opportunity to secure a large lot of fine 1905 calendars at a very good figure. More than enough have been bought to present one free to each of our regular subscribers at New Year's, and it occurs to us that probably our subscribers could use a few themselves to advertise their own business, and we could give them the benefit of our bargain. Hence we shall sell the extra ones at cost in lots of 50 each. We have bought a good many thousand, but there will not be nearly enough to go round, so we have decided that ***these extra calendars will positively not be obtainable by any except our subscribers.*** Read about the calendars on the opposite page.

BE PROGRESSIVE. Advertise your shop. There is no better ad for the money than a good calendar with your name on it. We put your name on them free if you order fifty. The customer you give it to will hang it up, and every time he looks at it for a whole year it tells him where to get his work done. If you run a shop, doesn't this strike you as a good investment? Haven't you got fifty customers that are worth spending 4 cents on for a year's advertising?

SOMEONE WILL GET LEFT, because there is only a limited number. Better order now—it isn't one bit too early. Pay later if more convenient—any time before Dec. 1—but get your order in and have them reserved for you. Then at New Year's you can hand each of your fifty best customers one of these calendars with your name on it, and ask him to accept, not ***a*** calendar, but ***your*** calendar, with the season's compliments. Pretty good idea, isn't it?

500,000 Buffalo Blowers in use

"Teddy" or Parker
Fairbanks or Davis



But crops are promising, and before spending your harvest money ask your dealer for prices on BUFFALO'S up-to-date line of Forges, Blowers, Drills, Steel Plate Punches and Shears, etc. Prices right, superior goods, guaranteed on every point. Money refunded if not entirely satisfied.

BUFFALO FORGE COMPANY, Buffalo, N. Y.

The American Blacksmith

Special 1905 Calendar

Our 1905 souvenir calendar, selected after careful search, is 5½ by 10½ inches, on stiff cardboard, handsomely done in colors by the well-known lithographic engraving process. Ten different colors are used to give the desired soft appearance. The surface also has a special roughening, which adds wonderfully to its attractiveness. A dark green month pad is used, harmonizing splendidly with the picture. The black engraving on this page is only intended to show the shape and design. An assortment of four different figures (the one shown here and three others) gives a pleasing variety. Each figure is of an Indian, attractively posed, and all are fine calendar subjects.

Don't forget that this is a special calendar, designed and made for us only. It is entirely different from the large number of cheap stock calendars seen everywhere. Whoever sees it wants one; whoever gets one keeps it. One goes free, Jan. 1, 1905, to each regular reader. All whose subscriptions expire before that date should renew now, so as to be sure and get one. Here are the prices in lots of 50—See opposite page also.

(1) **50 calendars, your name on each, post paid . . $2.00**
(2) **50 calendars and one year's subscription $2.75**
(3) **50 calendars and four years' subscription . . . $4.00**

Buying in quantity we get a low figure and we offer them to readers at cost. You get the wholesale price on a retail order of fifty. You could not buy as good for $4.00 or $5.00. We are not figuring in any profit on them—the offer is simply an inducement for subscribers to renew their subscriptions promptly, NOW. While you are about it, why not pay for four years and save money? The paper itself is going to be made better each year. You save $2.00 on four years' subscription and you get 50 calendars to advertise your business, for about half what they are worth.

Whoever sees it wants one; whoever gets one keeps it.

This offer is good to all our readers whose subscription is paid to January, 1905. If yours expires before then, renew now so as to get in line for the calendar offer. Drop us a postal if you don't know how your subscription stands. We recommend that you get credit for four years—it's a special offer and will probably never be made again.

During September and October Only

We will give any reader six months' credit on his own subscription if he will send us one new yearly subscription, one year's credit for two new subscriptions. Get your brother craftsmen to take The American Blacksmith, and mention this special offer when you write us.

If you are not already a subscriber you can get in on this calendar offer, and save money too, by sending in your order for number (2) or (3) as above. Or send $3.00 even and get 50 calendars and the paper from October, 1904 to January, 1906. If you can't use 50 calendars in your business, $1.00 brings you the paper from October, 1904 to January, 1906, and one of our calendars free for your own home. We offer three extra months, October, November and December, FREE, as an inducement for you to subscribe NOW.

Remit by money order, express order or registered letter.

American Blacksmith Company

P. O. Box 974 ***Buffalo, N. Y.***

Prices Current — Blacksmith Supplies.

The following quotations are from dealers' stock, Buffalo, N. Y., Aug. 22, 1904, and are subject to change. No variations have taken place since last month's quotations.

All prices, except on the bolts, are per hundred pounds. On bars and flats prices are in bundle lots.

Bars—Common Iron and Soft Steel.

¼ in..	round or square;	Iron, $2.80;	Steel, $2.80
⅜ in.,	" "	" 2.40	" 2.40
½ in.,	" "	" 2.20	" 2.20

Flats—Bar and Band.

¼ x 1 in.,	Iron............$2.20;	Steel..............$2.20
¼ x 1½ in.,	" 2.10;	" 2.10
3-16 x 1½ in.,	" 2.80;	" 2.80

Norway and Swedish Iron.

¼ in., round or square	$4.90
⅜ in., " "	4.50
½ in., " "	4.80
¼ x 1 in.	4.80
¼ x 1½ in	4.20

Horseshoe Iron.

For No. 1 shoe, ⅜ x ½ in	$3.30
For No. 2 shoe, ½ x ⅝ in	2.90
For No. 3 shoe, ⅝ x ¾ in	2.80
For No. 4 shoe, ⅝ x ⅞ in	2.80

Toe Calk Steel.

½ x ⅜ in. and larger... $3.00

Spring Steel.

⅜ to 1½ in. Rounds.	Op. Hearth $3.00,	Crucible $5.00
1¼ to 6 in. by No. 4 gauge to ½ in. Flats	" 3.00,	" 5.00

Carriage Bolts. (Net Price per Hundred).

¼ x 2 in.	$0.54	⅜ x 2½ in.	$0.82
¼ x 2½ in.	.58	⅜ x 3½ in.	.96
¼ x 3 in.	.62	⅜ x 6 in.	1.31
5-16 x 2 in.	.65	½ x 4 in.	1.70
5-16 x 3 in.	.75	½ x 6 in.	2.10

Directory of Gas Engine Manufacturers.

Giving Size and Type of Engines up to Twenty Horse-power.

Bates & Edmonds Motor Co., Lansing, Mich., 1½, 2½, 4, 6, 8, 10 HP., vertical, 4 cycle.

Bauer Machine Works Co., Kansas City, Mo., 1½, 3, 4½, 6, 8, 10, 12, 15 and 20 HP., horizontal, 4 cycle.

Beaver Manufacturing Co., Milwaukee, Wis., 2, 3, 5, 6 and 8 HP., vertical, 4 cycle.

Central City Iron Works, Stevens Point, Wis., 2 and 4 HP., vertical, and 2, 4, 6, 8, 10, 13, 16, 18 and 20 HP., horizontal, all 4 cycle.

Central Machine & Tool Co., Battle Creek, Mich., 2, 4, 5, 8, 12, 15, and 20 HP., horizontal, 4 cycle.

Chicago Water Motor & Fan Co., Chicago, Ill., 1 to 20 HP., horizontal.

Columbus Machine Co., Columbus, Ohio, 3 HP., vertical, 4, 6, 8, 10, 12, 15, 17 and 20 HP., horizontal, 4 cycle type.

Cushman Motor Co., Lincoln, Neb., 1½, 3 and 6 HP., all horizontal, 2 cycle type.

C. H. A. Dissinger & Brother, Wrightsville, Pa., 2½, 3, 4, 6, 8, 10, 12, 14, 16 and 20 HP., horizontal, 4 cycle.

Fairbanks, Morse & Co., Chicago, Ill., 2, 3, 4, 6, 9 and 12 HP., vertical; 5, 8, 10, 12, 15 and 20, horizontal, all 4 cycle.

Gemmer Engine Co., Marion, Ind., 1½, 3, 4, 6, 8, 12, 16 and 20 HP., horizontal, 4 cycle.

Howe Scale Agency, Chicago, Ill., 2, 3, 5 to 20 HP., all horizontal, 4 cycle.

Kansas City Hay Press Co., Kansas City, Mo., 4, 5, 6, 8, 10, 12, 15 and 18 HP., horizontal, 4 cycle.

C. P. & J. Lauson, Milwaukee, Wis., 2, 2½ and 4 HP., vertical; 4½, 6, 8, 12, 15, and 20 HP., horizontal, 4 cycle.

Lazier Gas Engine Co., Buffalo, N. Y., 3½ light, 3½ heavy, 7 and 18 HP., vertical; 2½, 5, 7½, 10 and 15 HP., horizontal, all 4 cycle.

Lennox Machine Co., Marshalltown, Iowa., 2 and 3 HP., vertical; 4, 6, 8, 10, 13, 16 and 20 HP., horizontal, 4 cycle.

G. G. McLaughlin, Boston, Mass., 1½ to 20 HP., horizontal.

August Mietz, New York City, 1, 2, 4, 6, 8, 10, 15 and 20 HP., all horizontal, 2 cycle.

Milwaukee Machinery Co., Milwaukee, Wis., 2, 3½, 4½, 6, 8, 12, 14 and 16 HP., horizontal, 4 cycle.

Myrick Machine Co., Olean, N. Y., 2, 3, 4 and 5 HP., vertical; 5, 10, 12, 15 and 20 HP., horizontal.

National Engine Co., Rockford, Ill., 2 and 3 HP., vertical.

New Era Gas Engine Co., Dayton, Ohio, 1, 2½ and 4 HP., vertical; 4, 6, 8, 10, 12, 14, 16, 18, and 20 HP., horizontal, 4 cycle.

Otto Gas Engine Co., Philadelphia, Pa., 2 and 3½ HP., vertical; 3½, 5, 8, 12, 15 and 20 HP., horizontal, all 2 cycle.

Peerless Motor Co., Lansing, Mich., 3, 6, 8 and 12 HP., vertical, 4 cycle.

Temple Pump Co., Chicago, Ill., 2, 4, 6, 8, 10, 12 and 16 HP., two-cylinder.

Waterloo Motor Works, Waterloo, Iowa, 1½ and 3 HP., vertical, and 3½, 6, 9, 12 and 17 HP., horizontal, 4 cycle.

F. M. Watkins Manufacturing Co., Cincinnati, Ohio, 2, 3, 4, 6, 8, 12, 15 and 18 HP., all horizontal and 4 cycle type.

Weber Gas & Gasoline Engine Co., Kansas City, Mo., 2½, 5, 6, 8, 10, 12, 14, 16 and 18 HP., horizontal, 4 cycle.

Trade Literature and Notes.

THE THOMPSON FOOT POWER VISE with steel anvils for forming, sharpening and welding calks on horseshoes and for bending and shaping hot iron is claimed by the makers to be a great time-saver. Shoes can be made square or sharp for winter or summer use, and the dies are so shaped that the calks are better formed than in the ordinary way, and three times as many can be made in the same time. Write Thompson Tuyere Iron Company, 2209 N. N. Jersey St., Indianapolis, Ind., for further information.

BLACKSMITH DRILLS is the subject of an exceptionally attractive folder just issued by the Sidney Tool Company, Sidney, Ohio. This is a new firm and their advertisement appears on this page. They are manufacturing a complete line of hand and power drills for blacksmiths and wagon builders, some of which are illustrated and described in the folder. It will be sent free to any address.

A HANDSOME COVER in colors adorns the latest catalogue of the Electric Wheel Company, of Quincy, Ill. It is a book of 48 pages, containing many interesting illustrations. It is a catalogue and price list of steel wheels for anything on wheels, and handy wagons for anything that is hauled. This catalogue is a good illustration of how interesting such a publication as this can be made. The same can be had upon request to the manufacturers.

REMOVAL ANNOUNCEMENT.—The Champion Tool Company, of Conneaut Lake, Pa., have just announced their removal to Meadville, Pa., cor. Pine and South Main streets, where with their greatly enlarged factory facilities and improved shipping arrangements, they will be in better position than ever before to take care of their many customers. They state that in building and equipping their new building they have spared neither time nor money to make it complete in every detail, and that they now have one of the most complete factories in the world for the manufacture of Farriers' and Blacksmiths' tools.

BADGER PUNCHES AND SHEARS.—The new machine shown in the advertisement of The Rock River Machine Company, of Janesville, Wis., on page xxvii, is only one of a large line which they manufacture. It has been their aim to place a tool on the market for general blacksmithing and repair shops which is powerful, convenient and at the same time very reasonable in price.

On this tool will be noticed the triple gear, where the lever bar operates, with which device, the makers state, ONE man can EASILY handle the machine up to its capacity, punching 5-8 x 1-2, shearing 4 x 5-8 flats, 10 x 1-4 band iron, 1-inch round iron. The machine weighs 800 pounds and they furnish three sets of punches and dies and lever bar. Catalogue and prices cheerfully furnished on application to the makers.

When you Buy, Buy the Best.
ALL SIGNS POINT to the

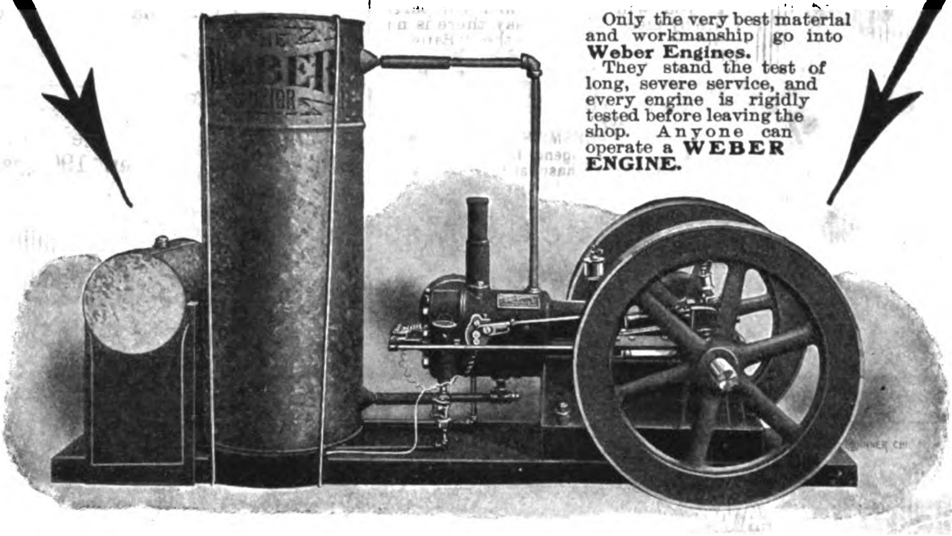
WEBER

as being the best engine built for Blacksmiths and Wagon Builders.

Over 8100 Weber Junior

2½ H. P. ENGINES

Now in use. Isn't this a remarkable proof of the superior qualities of our engines? Read our iron-clad guarantee, and the testimonials, two out of a thousand, all of them alike. We build engines from 2½ up to 300 horse-power. If our Weber Junior isn't large enough, let us quote you on our 5 horse-power. More than **2,400** of these were put to work during **1903** making money for Blacksmiths and Carriage Builders.



Only the very best material and workmanship go into **Weber Engines.** They stand the test of long, severe service, and every engine is rigidly tested before leaving the shop. Anyone can operate a **WEBER ENGINE.**

Weber Gas and Gasoline Engines are Safe, Solid, Strong and Simple.

Weber Gas and Gasoline Engines are Durable, Compact, Complete and Economical.

GUARANTEE.

All Weber Engines are guaranteed to be of the very best material and the very best workmanship, and we hereby agree to replace any part found defective f. o. b. our works without cost for a period of two years.

We guarantee the consumption of fuel as noted below. We guarantee the speed to be steady and uniform. We guarantee that changes in temperature will not affect the engine's running. We guarantee interchangeability of parts. We guarantee that the Weber can be operated without constant regulation of the trottle valve.

Weber Engines operate on one-tenth of one gallon of gasoline per horse-power per hour.

MURRAY, UTAH.

GENTLEMEN:—We have been using one of your Junior Engines about sixteen months, and in that time have given it a fair trial. We run a 16-inch blower, 30-inch band saw, 12-inch circular saw, drilling machine, turning lathe and emery grinder. We also have a pump connected with engine by cable at a distance of 280 feet from the engine and draw water for stock and culinary purposes.

We do general blacksmithing, wagon and carriage work, wood turning, &c., and run four of our heaviest machines at once without any trouble and apparently not a very heavy load for the engine. Our expense outside of gasoline and oil during the 16 months has not exceeded one dollar all told. We like the engine very much on account of its simplicity and ease of management.

Yours truly, A. M. PALMER & SONS.

SINKING SPRINGS, OHIO.

TO WHOM IT MAY CONCERN:—I bought a Weber Jr. gasoline engine some months ago, and it is the best value for the money I have ever obtained. I am running a band saw, machine drill, rip saw, wood lathe, iron lathe, emery stand, feed mill and corn sheller. It seems to me that this little engine must pull at least 5 H. P. I can show anyone how to operate it in two minutes. I can see that my business has increased 30 per cent since I put in power. I have seen several makes of engines, but none to compare with the Weber as an economical power. I hardly notice the cost and can afford to start up for a five cent job. I believe my engine will more than pay for itself for the first six months; all I regret is that I did not purchase an engine sooner. I would not try to run a shop again without power; and anyone buying a Weber will be pleased with it.

Very truly yours, J. S. OVERHULTZ.

Send Postal today for our Complete and Interesting Catalogue, Free.

Weber Gas and Gasoline Engine Co.

P. O. Box V 1114, Kansas City, Mo.

New York Offices, 115 Liberty St., N. Y. C.

HAWKEYE WRENCH CO.
Marshalltown, Iowa.

DIES CLEAN THREADS SIZES SHOWN ON WRENCH.

PATENT NO. 720554

HAWKEYE (REGISTERED)

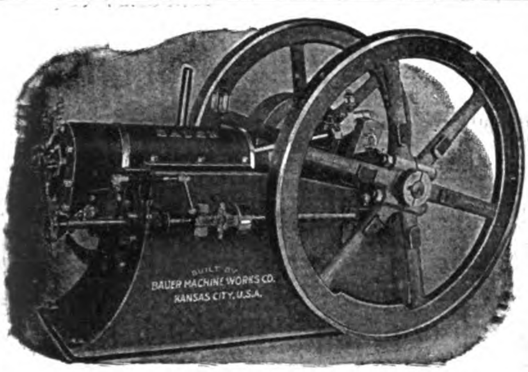
HAS MORE USES THAN ANY WRENCH MADE.

5 IN 1
NUT WRENCH, PIPE WRENCH, THREAD CUTTERS

WRENCH 8 1-2 INCHES LONG.
SMALL JAW TAKES FROM 3-16 TO 3-4 INCH IRON.
LARGE JAW TAKES FROM 1-2 TO 1 1-8 INCH IRON.

MADE OF 50 POINT OPEN HEARTH DROP FORGED CARBON STEEL, SCIENTIFICALLY HARDENED.

PATENTED IN U. S., CANADA, AND FOREIGN COUNTRIES.



BAUER GASOLINE ENGINES..

The Acme of Simplicity and Perfection.

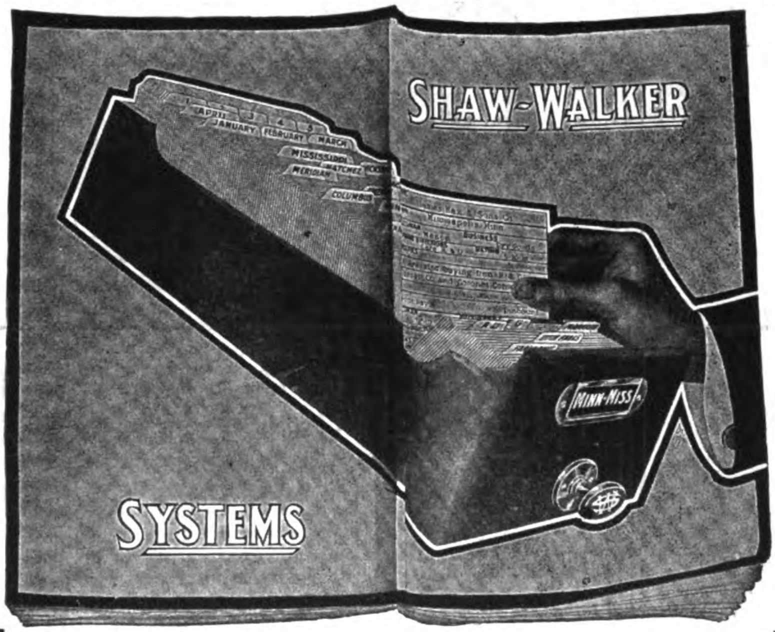
If you will examine and compare, piece by piece, you will say there is no other quite so good as the "Bauer." All sizes from 1½ to 20 H.P. Write at once for free catalogue containing long list of letters from satisfied users. Our prices are also very interesting, considering quality.

THE FIRST BLACKSMITH in any town who buys of us gets the agency for his locality, a discount on his purchase, and a commission on his sales. A good engine sells readily. The Bauer is the best.

Write us Today.

Bauer Machine Works Co.
115-120 W. 18th St., KANSAS CITY, MO.

47 SYSTEMS
FOR BUSINESS MEN



THIS BOOK IS FREE

It illustrates 47 different kinds of business that are successfully conducted by the use of Shaw-Walker Card and filing systems. It tells you how to improve your office systems. How to save time, money and labor. How to increase the efficiency of your employees. How to decrease your pay roll. One hour invested in reading this catalogue will pay you large dividends during 1904. Send today for this valuable 58 page free catalogue.

THE SHAW-WALKER CO.

Branch at Chicago in the Marquette Building.

Muskegon, Michigan.

HONEST DEALINGS

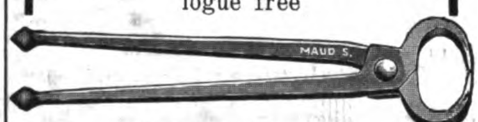
Before an advertisement is accepted for this journal, careful inquiry is made concerning the standing of the house signing it. Our readers are our friends and their interests will be protected. As a constant example of our good faith in AMERICAN BLACKSMITH advertisers, we will make good to subscribers loss sustained from any who prove to be deliberate swindlers. We must be notified within a month of the transaction giving rise to complaint. This does not mean that we will concern ourselves with the settlement of petty misunderstandings between subscribers and advertisers, nor will we be responsible for losses of honorable bankrupts.

One Cent

is all it will cost you to send for our hanger, giving a table which will enable you to cut

Horseshoe Bar Molds

without waste. We will also send you our new 1904 catalogue free



No. 23. Maud S Pincer

Champion Tool Co.

Meadville, Penna.

Blacksmiths Can Make Money

Bishopville, Ohio, Sept. 20, 1903.

DR. A. C. DANIELS,
Boston, Mass.

Dear Sir:—After I had been selling Dr. Daniels' Veterinary Medicines for about nine months I wrote you saying I was well pleased with my success. Since then my sales have almost doubled, and the goods returned have decreased, only \$3.50 returned out of over \$800; a little less than ½ of 1 per cent.

I think my agency is worth more to me than a fourth-class post office, and the best of it is the people do the talking for me now.

Thanking you for your favors in the past, I am, Respectfully,
(Signed) E. N. HOON.

Send to

172 Milk Street,
Boston, Mass.

Dr. A. C. Daniels,

Largest Manufacturers of Veterinary Medicines in the World,

For full information.

TWO GOOD WORKS
ON
HORSESHOEING

A TEXT BOOK ON HORSESHOEING, by A. Lungwitz. A complete treatise on anatomy, shoeing, bad feet, interfering, etc. Cloth bound, 168 pages, 141 illustrations - - - - - **$2.00**

MAGNER'S A B C GUIDE to sensible horseshoeing. Cloth bound, 130 pages, 400 illustrations - - - - - - - - - - - - - - - - **$1.00**

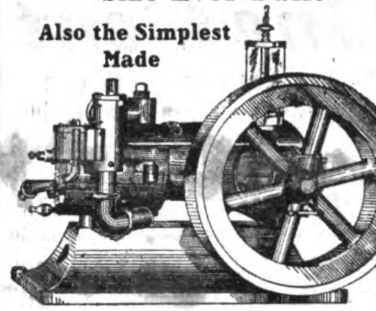
Sent postpaid on receipt of price.

American Blacksmith Co.

Box 974——Buffalo, N. Y.

Most Powerful Engine for its Size Ever Built

Also the Simplest Made



3 H.P. 21 INCHES LONG 150 POUNDS

There's value in our agency. One blacksmith sold three the first month.

Get Catalogue and Particulars
—Free on request.

Cushman Motor Co.
Lincoln, Nebr.

WANTED! Blacksmiths and Horseshoers

everywhere to sell the

EQUINE WATER-BOOT

the only ***Patented*** and ***Scientific*** device for applying nature's own remedy, water, to the foot of a horse.

By its use ***Hard, Dry, Brittle*** and ***Contracted*** feet are made soft and pliable like those of a horse in pasture. Pasture is brought to the horse instead of the horse to pasture. The ***soaking tub*** is a thing of the past.

For ***Diseased Feet*** the boot is ***Medicated*** and becomes a perfect ***Antiseptic*** and ***Disinfectant.***

The boot is ***Durable*** and ***Artistic*** and ***Sells at Sight.***

Made with or without frog. Prices range from $1.00 to $2.50 per pair. Sample pair mailed prepaid to any part of the U. S. or Canada on receipt of the retail price.

Liberal discounts and protection to agents and jobbers.

Send for circular and price list. Address,

THE EQUINE WATER-BOOT MFG. CO., 519 Hamilton St., ALLENTOWN, PA.

AN ATTRACTIVE OFFER

is here made to get you acquainted with our rapid selling specialties. Blacksmiths and wagon men all over the country are making nice profit by selling our goods with no trouble at all. Only a few specialties are shown here.

Our IXL Anti-Rattlers are easily put in and are guaranteed to stop rattle of pole or shaft.

Harsh's Dash Line Holder is a convenience every vehicle owner appreciates.

For 50 Cents, we will send you postpaid
1 pair IXL Anti Rattlers,
1 pair safety trace holders,
1 dash line holder.

For $1.25, we will send postpaid a dozen pair of single safety trace holders, or

For $1.50, one dozen pair of double safety trace holders.

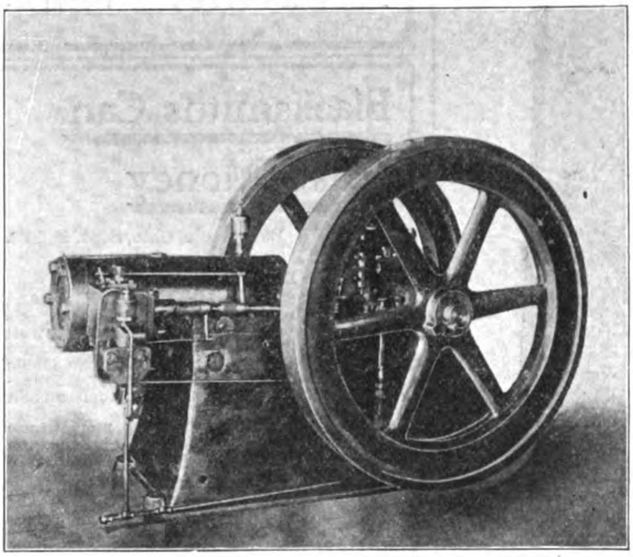
The Wabash Safety Trace Holder is a dandy. Safe, convenient. Can be worked in dark or with gloves.

WRITE TODAY.

Write for our circulars and price list.

Launder, Harter & Harsh Mfg. Company
20-30 So. Miami Street, - - - - Wabash, Indiana.

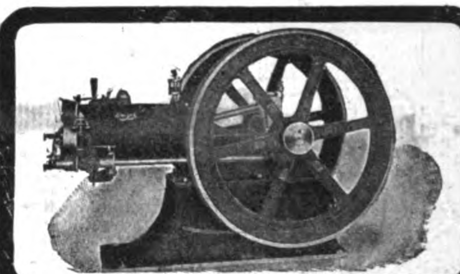
THE DICKINSON



Starts Easily. Runs Quietly.

All bearings adjustable. Bronze boxes. Taper key adjustments. Warranted to please. Write for prices and terms.

Central Machine & Tool Co., Ltd.,
BATTLE CREEK, MICHIGAN.



The Top Notch of Satisfaction is Attained in our Line of

BADGER GAS AND GASOLINE ENGINES

STATIONARY—PORTABLE—TRACTION—MARINE

THEY ARE UNEXCELLED

For great power at low fuel consumption.
For quiet and smooth running qualities.
For general reliability and easy starting.
For regularity of speed and close regulation of power.

We do not make a cheap engine, but cater to that class of buyers who wish a first-class article, something that will not mean continual trouble and repairs. A cheap engine is a very expensive machine at any price.

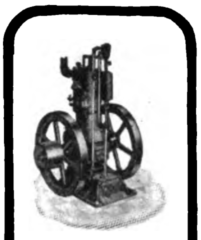
We want blacksmiths everywhere to act as agents for this, the most complete, successful and best money-making line of gasoline engines on the market.

Every engine sold on trial, satisfaction guaranteed. Write at once for exclusive agency, prices and terms.

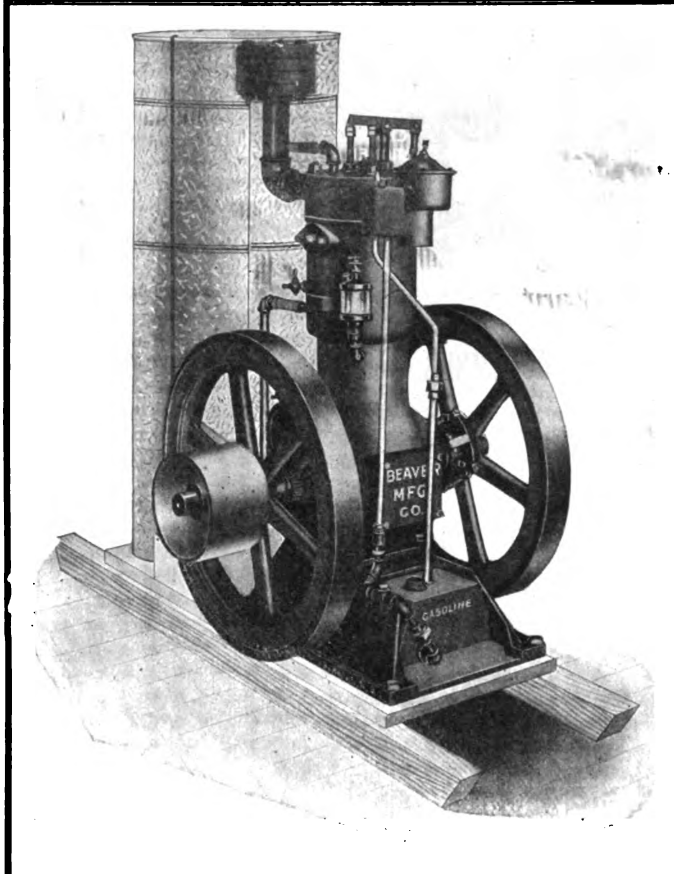
Handsome 48 page Catalog Free.

C. P. & J. LAUSON
Manufacturers
101 W. Water Street, - MILWAUKEE, WIS.

RELIANCE ENGINES



THE PERFECT POWER



"WHY"

THE BEST MATERIAL

ACCURATE CONSTRUCTION

UNEQUALED PERFORMANCE AND POSITIVE GUARANTEE

"WHY"

DEVELOP H. P. AS RATED

EASY TO START

USE LESS FUEL

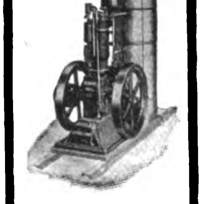
NOTHING TO ADJUST

ALWAYS READY

THE PRICE IS RIGHT

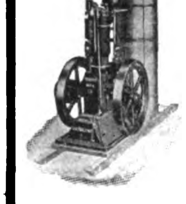
BUILT FOR BUSINESS ABSOLUTELY PERFECT

THE LATEST AND MOST IMPROVED ENGINE ON THE MARKET



GET OUR PRICES

RESPONSIBLE AGENTS WANTED EVERYWHERE. CORRESPONDENCE INVITED.



Beaver Manufacturing Co.

Milwaukee, Wisconsin

DON'T BUY GASOLINE ENGINES until you have investigated "THE MASTER WORKMAN," a two-cylinder gasoline engine, superior to all one-cylinder engines. Cost less to buy and less to run. Quicker and easier started. Has a wider sphere of usefulness. Has little or no vibration. Can be placed anywhere without expense for foundation. Weighs less than one-half the weight of one-cylinder engines. Please give size of engine required. We make 2, 4, 6, 8, 10, 12 and 16 horse-power. Please mention this paper. Send for catalogue.
THE TEMPLE PUMP CO., Established 1853. Meagher and 15th Streets, CHICAGO.

PEERLESS Motor Co.
Lansing, Mich.

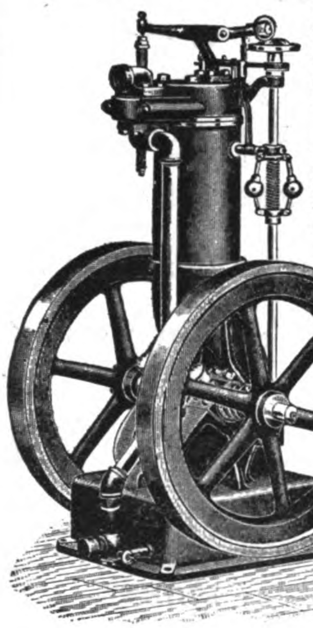
For Simplicity of Construction, Durability and ease of Operation

The NOISELESS GAS and GASOLINE ENGINE has no equal.

Made in 3, 6, 8 and 12 H. P. Write us for prices.

Agents Wanted in Every Town.

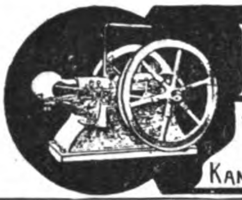
"WINNEBAGO CHIEF"
"CHEAPEST POWER ON EARTH."



Built in 2 and 3 H. P. Simplest, strongest and most reliable engine in the market. Satisfaction guaranteed or engines taken back. Prices so low you can't afford to do without.

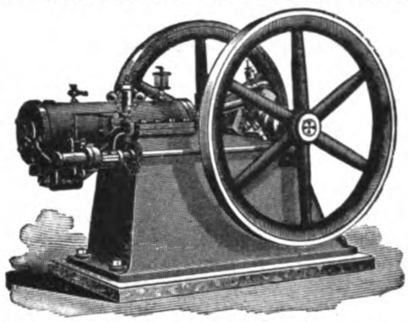
Write for catalogue and prices.

National Engine Co., Rockford, Ill.



LIGHTNING GASOLINE ENGINE
NEW AND IMPROVED FEATURES SAVING EXPENSE
INCREASING POWER ALL SIZES WRITE FOR CATALOGUE
KANSAS CITY HAY PRESS CO. 482 MILL ST KANSAS CITY MO.

COLUMBUS GASOLINE ENGINES
ARE THE THINGS FOR BLACKSMITHS

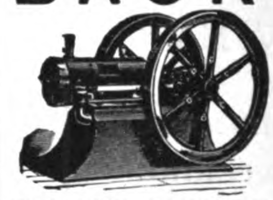


Send for Catalogue 33, Stating Horse Power You Need.

COLUMBUS MACHINE COMPANY,
Columbus, Ohio.

ECLIPSE
GAS AND GASOLINE ENGINES.
Vertical 2, 3, 4, 5, H. P.
Horizontal 5, 10, 12, 15, 20, 25, H. P.
Designed and Built for BUSINESS.
Catalogue on request. . . . . .
MYRICK MACHINE CO., Olean, N.Y.

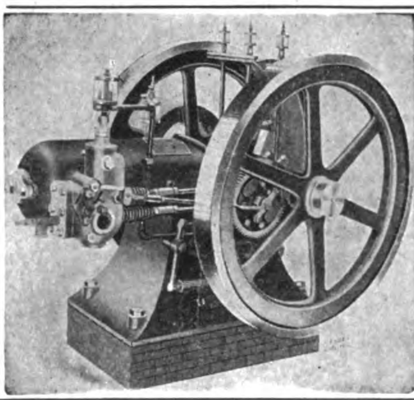
BACKUS



1 TO 100 H. P.

COMPACT AND RELIABLE.

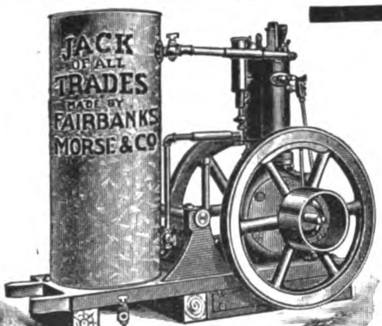
GAS AND GASOLENE ENGINES.
Simple, Economical, Durable You need one in your business. Write for circular and prices.
CHICAGO WATER MOTOR AND FAN CO.
22-24 S. Canal St., Chicago, Ill.



Model Gas and Gasoline Engines
Water or Oil Cooled

The most economical and simplest engine on the market. No cylinder head packing to blow out, and with our automatic sensitive governor, absolute regularity of speed. Stationary, Portable, Horizontal, Vertical Hoists, Pumping and Marine. Send for Catalogue No. 11.
We build the best launch engine of 3 and 6 H. P., with Reversible Bronze Propeller Wheel and Ideal Muffler.
If interested, send for circular.

CENTRAL CITY IRON WORKS
STEVENS POINT, WIS.



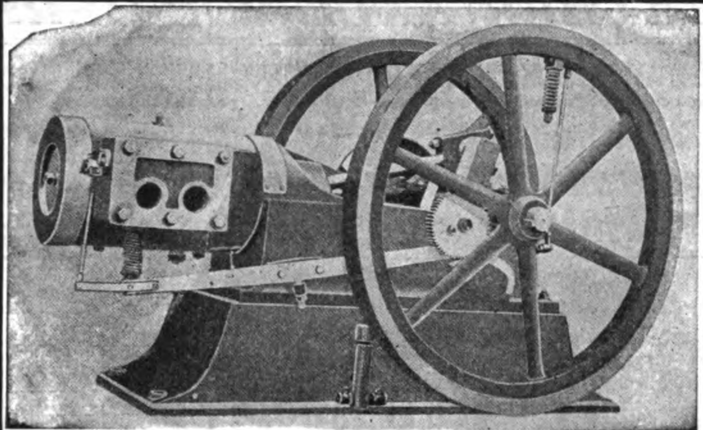
THE JACK OF ALL TRADES GASOLINE ENGINE
Develops over 2 H. P. It costs very little.
Send for Illustrated Booklet No. 80-F.

Fairbanks-Morse Gas or Gasoline Engines
Are best for the Blacksmith or Wheelwright

They develop more power for the money than any other. Get our catalogue and prices before purchasing elsewhere. Address nearest house.

Fairbanks, Morse & Company,

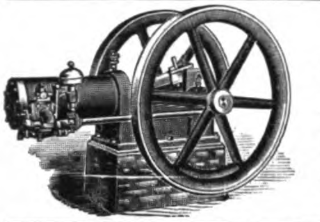
Chicago	St. Paul	Cleveland	Minneapolis	St. Louis	Omaha
Detroit	Denver	Louisville	San Francisco	Kansas City	Los Angeles
Indianapolis	Portland, Ore.	New York	Cincinnati	Salt Lake City	London, Eng.



POWER IS WHAT YOU WANT

We Have It
in the
DAVIS GASOLINE ENGINES
Write for Catalogue and Prices

Waterloo Motor Works
Waterloo, Iowa



The Village Blacksmith's Dream.

Asleep on his cot he has a vision. The old dilapidated shop in which he has toiled for years has been transformed, and in its place he sees a new shop with modern equipment—Power Hammers, Drills, Blowers and whirling shafts driven by a "Capital" Gasoline Engine. Business increases and his coffers are overflowing with dollars. But alas, there is an awakening and he finds this all an empty dream. However, realizing the usefulness of power, he buys one of the Capital engines and thus makes his dream a reality. Kind friends, do thou likewise. Post Office address of builders.

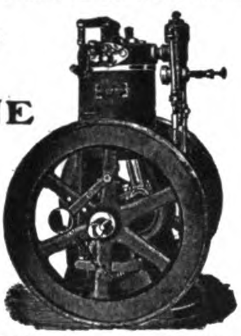
C. H. A. DISSINGER & BRO., - Wrightsville, Pa.

NO MORE TROUBLE
about ignition in your engine if you get a
Remy Magneto Igniter,
suited for touch or jump spark ignition, with any gas or gasoline engine. They are absolutely reliable spark generators and the simplest ignition apparatus manufactured. Magneto Dynamos, Magneto Oscillators, Magneto Alternator Igniters, jump and touch spark coils, etc.

REMY ELECTRIC CO.,
ANDERSON, IND.

NO BLACKSMITH SHOP COMPLETE WITHOUT POWER.

No Power so
HANDY
as a Good
GASOLINE ENGINE.

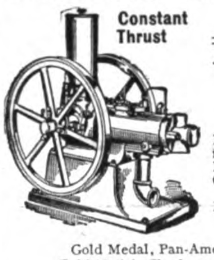


Let us send you our catalogue and quote prices. Our Specialty 1½, 2½ and 4 H-P. State your power needs. If you have a steam engine give full description

We sometimes make exchanges.

BATES & EDMONDS MOTOR CO., - Lansing, Mich.

The MIETZ & WEISS Oil and Gas Engines



Constant Thrust

STATIONARY and MARINE
1-60 H. P.

Adopted by the U. S. and Foreign Governments.
Most Economical and Safest Power known. Runs with common kerosene, distillate or fuel oils.
It will pay you to consult me before placing your order elsewhere.
For Pumping, Electric Lighting, Charging Storage Batteries, and all other Power Purposes.
Highest award for Direct Coupled Engine and Dynamo, Paris Exposition, 1900.
Gold Medal, Pan-American Exposition, 1901.
Gold Medal, Charleston, S. C., Exposition, 1902.

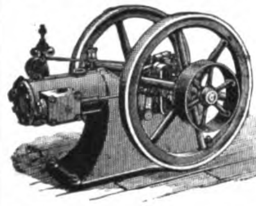
A. MIETZ, 128-138 Mott St., New York
Send for Catalogue, Dep. 34.

Have You an Engine?

If so, **The Practical Gas Engineer** will tell you how to get the best results from it. A plainly written book telling how to erect, operate and care for gas and gasoline engines. Cloth bound, 152 pages. Sent prepaid, for $1.00.

American Blacksmith Co.,
Box 974, BUFFALO, N. Y.

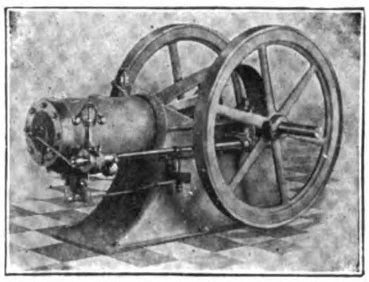
An Engine That You Can DEPEND UPON at all Times
The WATKINS



is solid, substantial and well-made; has large, phosphor bronze bearings, forged steel crank and connecting rod, has everything that a **Good Gas or Gasoline Engine** ought to have. Our catalogue shows all sizes and describes them in detail. Shall we send you one?

The Frank M. Watkins Mfg. Co.,
537 Baymiller Street, Cincinnati, Ohio.

RELIABILITY AND ECONOMY
are combined in our engines.



Simple design, few parts, best material, good workmanship.

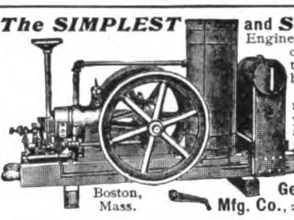
Milwaukee Machinery Co. **3015 Walnut St. MILWAUKEE, WIS.**

BUILD YOUR OWN GASOLENE MOTOR

We supply the castings, drawings and all accessories. A complete line of rough castings, also finished Motors for Bicycle, Automobile, Marine or Stationary. A 2-cent stamp gets our catalogue.

STEFFEY MFG. CO.
Pennock and Brown Sts., Philadelphia, Pa.

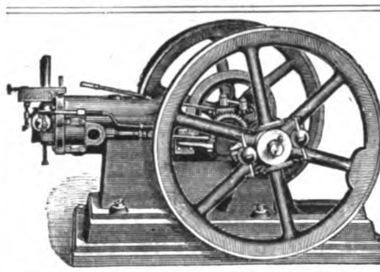
The SIMPLEST and ***STRONGEST***



Engine made. Never gets out of order. Just think, about a cent an hour per horse power. Thousands in use. 1 1-2 to 40 h.p. Two years' guarantee. We also carry wood working machinery, shafting, hangers and pulleys.

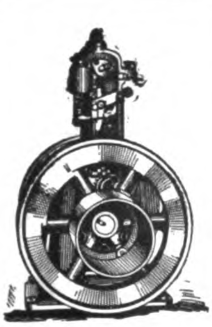
Boston, Mass. **Geo. G. McLaughlin Mfg. Co.,** 24 Washington St., N.

THE LENNOX ENGINES
GAS OR GASOLINE



OUR electric igniter can be cleaned while the engine is running. Other makes cannot be cleaned without stopping and taking the igniter out. Send for catalogue.

LENNOX MACHINE CO.
MARSHALLTOWN, IOWA.



THE MARKED SUPERIORITY OF THE
"OTTO"
GAS AND GASOLINE ENGINES

in ease of starting and smoothness of running is readily apparent when compared side by side with the cheaper kind. While "comparisons are odious" they are sometimes helpful in arriving at the truth. See our exhibit at the World's Fair, Block 41, Machinery Hall, and draw your own conclusions.

THE OTTO GAS ENGINE WORKS
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For Central New York: - - A. T. Gibson, W. Winfield.

For Industrial Locations

In Illinois, Wisconsin, Iowa, Minnesota, Upper Michigan, North and South Dakota, write to W. B. Davenport, Industrial Commissioner, 1329 The Railway Exchange, Chicago.

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A SHORT
TOP TALK

"Send for our 1904 catalogue just out. It will interest you from a pocket-book standpoint."

Bauer Bros. Mfg. Co., 937 to 943 W. 8th St., Cincinnati, Ohio.

The VICTOR Buffer

FOR USE ON EITHER PLATFORM OR ELLIPTIC SPRINGS.

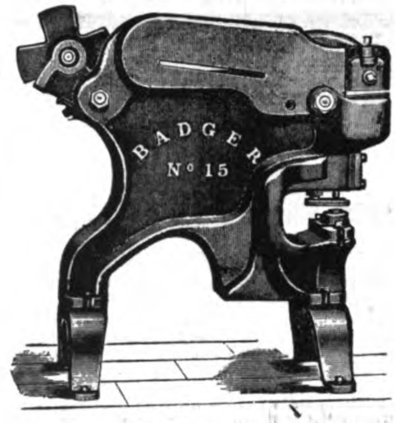
Quickly Attached by Anyone without the Use of Bolts or Straps.

Indianapolis Bolster Spring Company, Indianapolis, Ind.

WHAT? YES!

No. 15 THE BADGER No. 15

Will punch 5/8" hole in 1/2" iron.
Will shear 5/8" by 4" flat iron.
Will shear 10" by 1/4" band iron.
Will shear 1" round bars.



Weight 800 Lbs.

CAN YOU BE WITHOUT ONE?

Write for Catalogue and prices.

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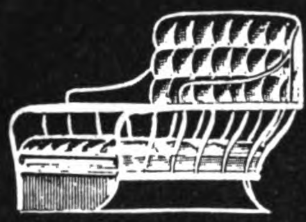
JANESVILLE, WIS., U. S. A.

La Crosse Buggy Top & Supply Co.

La Crosse, Wis.

Manufacturers of



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BODIES GEARS

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Dealers in the West will save freight by buying from us.

Jobbers of

Anything and Everything for Buggies

STAR HORSE SHOEING RACK......

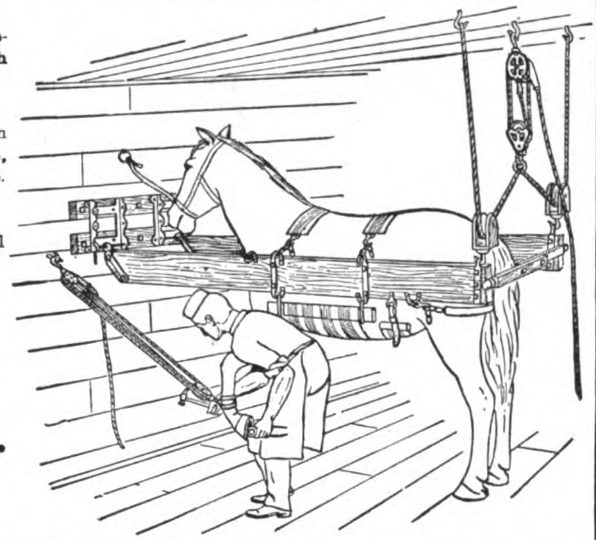
Strong and **quick** to operate. Perfect **safety** both to horse and man.

Hundreds in use now.

Any foot, hind or fore, can be handled with equal **ease**, and by an automatic device.

WRITE US,

for circular, which will tell you ALL about this Rack.



Manufactured by

HUNT, HELM, FERRIS & CO.

Harvard, Ill.

DON'T BE DECEIVED

Look at a True Photograph of

Benedict's Safety Horse Rack

in operation. The handling of both feet on the one side. The perfected method of handling one or all feet of the horse at the same time at the will of the operator. The most reliable Rope Hoists manufactured. The Automatic self-locking Bar Clamp, which enables the operator to shift the foot from driving position to clinching position in one second of time without taking any hazardous risk as with other racks.

Pat'd April 9, 1901.

BENEDICT'S SAFETY HORSE RACKS are ironed off in soft steel forgings. No castings are used in their construction. Castings are clumsy and unreliable, to say the least.

N. B.—Benedict's patent covers the "Safety Horse Shoeing Rack" the "Star Horse Shoeing Rack" (now manufactured by Hunt, Helm, Ferris & Co., of Harvard, Ill.) and

Benedict's Safety Horse Rack

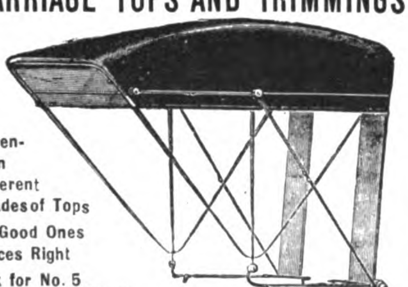
the latter being our latest perfected and complete Rack. Made up by experienced workmen and under the supervision of the patentee himself.

Guaranteed better than any other RACK manufactured—regardless of price.

Benedict Manufacturing Co.

Delaware, Iowa American Falls, Idaho
Brighton, Ontario, Canada

A COMPLETE LINE OF
CARRIAGE TOPS AND TRIMMINGS



Seventeen Different Grades of Tops
All Good Ones
Prices Right
Ask for No. 5 Catalogue

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THE "BUSH" Low-down Handy Wagon

WITH 4-IN. TIRE STEEL WHEELS

We make any size wheels to fit any skein.

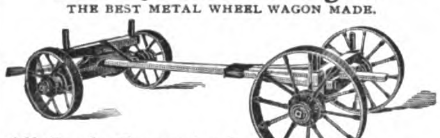
WRITE TO C. BUSH QUINCY ILL.

(MENTION THIS PAPER.)

THE GENEVA

Handy Farm Wagon

THE BEST METAL WHEEL WAGON MADE.



All Goods Guaranteed

Pressed steel wheels, any height and width tire, interchangeable hubs. Gears of selected stock, thoroughly ironed. Made in several styles.

WE ARE ESTABLISHING ONE AGENT IN EVERY TOWN.

Send for Descriptive Circulars to

Geneva Metal Wheel Co.

GENEVA, OHIO

An Automobile, A Weber Gasoline Engine

and other prizes in cash given away

ABSOLUTELY FREE

YOU ARE BOUND TO WIN——NO POSSIBLE WAY TO LOSE.

To the Customer whose purchases total the greatest, in Dollars and Cents, from September 1st, 1904 to April 15th, 1905, we are going to give, ABSOLUTELY FREE, an AUTOMOBILE valued at $800.00.

To the Customer whose purchases are Second in amount during this period we shall give, ABSOLUTELY FREE, a 2½ h. p. WEBER GAS or GASOLINE ENGINE, valued at $125.00.

To the Customer whose purchases are Third in amount, during this period, we shall give, absolutely free, a CASH prize of $50.00.

To the Customer whose purchases are Fourth in amount, during this period, we shall give, absolutely free, a CASH prize of $25.00.

To the Customer whose purchases are Fifth in amount, during this period, we shall give, absolutely free, a CASH prize of $15.00.

A GRAND TOTAL OF $1,015.00 TO BE GIVEN AWAY

We appreciate the great volume of business with which we have been favored, and as an inducement for the continuance of this fine business, also for new business, we make this most extraordinary offer. No scheme or complicated conditions connected with this offer. Everyone in the trade is eligible and has an equal opportunity to compete for any one of these prizes. The reason for this is that while we control a large volume of business, it is comprised mostly of small orders. No person other than ourselves will know what another is purchasing, so everyone in the trade can compete on the same fair basis. There are no complicated conditions whatever. All you have to do is to send us your orders, a correct accounting being kept of each and every order. After April 15th the automobile will be awarded to the customer whose purchases total the greatest; the Weber engine goes to the second; a $50.00 cash prize to the third; a $25.00 cash prize to the fourth; a $15.00 cash prize to the fifth.

This automobile to be awarded to the customer whose purchases total the greatest amount from September 1, 1904, to April 15, 1905. The list price and the price at which it has sold is $800.00. It cost us, at wholesale exactly, $640.00. It is on exhibition at our store and is open for inspection to any one who may desire to see it. It has the latest French style body, four full elliptic springs, long wheel base, 8-in. Diamond tires, adjustable wheel post, 7 h. p. engine, a sliding gear transmission, something no other runabout can boast of; artillery style of wheels, gasoline capacity for 125 miles, water capacity for 500 miles, the cost of running one quarter of a cent a mile. This machine is manufactured by members of the Association of Licensed Automobile Manufacturers, and has been exhibited and is represented in the leading cities in this country. When you think that your chance of winning this is equal to anyone, doesn't this appeal to you as a fine offer? We want you to take advantage of it and get in line at the very start. We have circulars complete in their description of this machine, and shall be glad to mail them to anyone upon request.

This 2½ h. p. Weber engine to be awarded to the man whose purchases are second greatest in amount from September 1st, 1904, to April 15th, 1905. This engine is well and favorably known and represents without question the best gas or gasolene engine on the market to-day. The space here is to limited too give an extended discription, but descriptive circulars will be cheerfully sent to any address upon request. If you don't win the automoble, there is a very good chance for you to win this engine. No one knows what your purchases amount to, you don't know what the other man is buying, so send on your orders and don't forget to secure the advantage of an early start.

OUR GOODS ARE THE BEST AND PRICES THE LOWEST.

The quality of the goods and our prices are not to be affected by this offer. We make this offer merely to advertise and stimulate business and you can ill afford to pass it by. Remember that a correct accounting of your purchases will be kept from September 1st to April 15th. Any and everyone who sends in an order within that time will compete for these prizes. Even though your order may appear small to you, don't fail to send it, for, as we have explained before, while we control a great volume of business, the orders are small and yours will no doubt prove large and a great factor in the winning of one of these prizes. Although you have the same chance as anyone else, even though you don't win a prize, YOU ARE BOUND TO GAIN for we give you better value for less money than you can obtain elsewhere. We **have just issued a new revised sheet, reducing considerably our Spring catalogue prices** on both axles and springs. **You will be surprised** at the low prices we offer and we want you to **write for this sheet, also our Spring 1904 catalogue,** if you fail to have it, so that you will be in line early for the greatest offer that was ever presented to you.

Don't Forget That There is Nothing to Lose. But Everything to Gain.

Further particulars, if desired, cheerfully sent at your request.

CRAY BROTHERS, Cleveland, O.